The

Electrical Review

VOL. CV. OCTOBER 25, 1929. No. 2,709

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman and Joint Managing Director: G. H. ALABASTER, Assoc.I.E.E.

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Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 9971 (6 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Electric Ship Propulsion.

ALTHOUGH much has been written in recent years on the subject of the application of electricity to the propulsion of ships and the advantages of this system in comparison with other systems of propulsion have been frequently set forth, it has not always been possible to quote actual operating figures—figures obtained when the vessel is running under commercial conditions at sea, as distinct from figures obtained on trial trips—in justification of the claims which have been made for the electric drive. We are, therefore, particularly pleased to welcome the paper entitled "Electric Propulsion as Applied to Passenger Liners" (an abstract of which appears elsewhere in this issue) which was presented by Mr. Eskil Berg to the Institute of Marine Engineers. Mr. Berg is the head of the marine contracts department of the American General Electric Co., which was responsible for the machinery of the two electrically-propelled passenger liners *California* and *Virgina*, which have recently been put into service between New York and San Francisco, *via* the Panama Canal. As, however, he was unable to make the journey to this country, the paper was read by Mr. W. J. Belsey, of the British Thomson-Houston Co., Ltd., which is closely associated with the American concern named, and, moreover, was responsible for the electrical equipment of the P. & O. liner *Viceroy of India*, a vessel which differs not very greatly either in size or equipment from the two American ships mentioned above.

The principal feature of Mr. Berg's paper was the valuable data he gave of the actual performance of the *Virginia* during the course of a service voyage from New York to San Francisco and back, a total distance of 10,870 nautical miles, which is obviously sufficiently great to eliminate the effect of any errors due to inaccuracy of measurement and to give a clear idea of the capabilities of the vessel and her equipment.

It may be of interest to note before commenting on the performance data included in the paper that the *Virginia* is a twin-screw vessel 613 ft. 1¼ in. in length

and of 32,800 tons displacement, having machinery of 17,000 shaft-horse-power, which is capable of giving her a speed of 18 knots. Two turbine driven alternators, each having a rating of 6,600 kW at 2,880 r.p.m., generate three-phase current at a pressure of 4,000 volts. There are two synchronous induction-type motors, one directly connected to each propeller shaft, each motor having a normal rating of 8,500 horse-power at a speed of 120 r.p.m. When it is desired to run the vessel at cruising speed, *i.e.*, in the vicinity of 15½ knots, only one generator is required, the power required being nevertheless developed at maximum efficiency. Steam for driving the turbines is obtained from eight oil-fired water-tube boilers of the Babcock and Wilcox type, having a working pressure of 275 lb. per sq. in., the steam being superheated 200 deg. F. above saturation temperature. Under these conditions, with a vacuum of 28½ in., the steam consumption at full power works out at 8.1 lb. of steam per shaft-horse-power-hour, which is equivalent to 10.85 lb. per kW-hour, a very good performance when it is remembered that this figure includes all the auxiliary load, and that the power required for operating the refrigerating plant alone is about 800 h.p. The fuel-oil consumption is equally impressive, the run from New York to Havana showing a consumption of 0.715 lb. per s.h.p.-hour for all purposes. This is equivalent to 0.96 lb. per kW-hour, or, assuming a calorific value of 18,500 B.th.u. per lb., is the same as a coal consumption of 1.42 lb. per kW-hour, the coal having a calorific value of 12,500 B.th.u. per lb.

Apart from the actual performance data, Mr. Berg summarises the advantages of the electric drive in the light of the experience gained by the running of the *Virginia* and her sister ship. They need not be referred to in detail here, although emphasis may be put on the absence of vibration and noise, a valuable feature which has also characterised the *Viceroy of India*, and is in strong contrast to the well-known state of affairs on certain passenger vessels fitted with other forms of propelling machinery. Attention may also be drawn to the fact that the amount of boiler feed make-up water required on electric ships is less than one quarter of that on any other type of similar steamer. This striking result, which represents a considerable saving on the uneconomic deadweight which a vessel must carry, was widely commented upon during the course of the discussion which followed the reading of the paper, certain speakers venturing to question the accuracy of the figure given. In the absence of any definite data we need not venture an exact opinion, but that a considerable saving is effected in make-up water is certain.

Finally, in the light of the above advantages Mr. Berg makes a comparison between the performance of the *Virginia* and that of a Diesel engine driven ship of approximately the same size and speed. As regards fuel consumption, the advantage is, of course, with the latter vessel, but when the relative costs of fuel oil and Diesel oil are considered (the latter costing twice as much as the former in New York, although in this country, it should be observed, the relative costs are as five is to four) the balance is in favour of the electrically-propelled vessel. The comparison with the geared turbine vessel *Bremen* is vitiated by the fact that the two ships differ very greatly as regards size and power and speed, although it is of interest to speculate on the possibilities of a holder of the blue-ribbon of the Atlantic propelled by electrical machinery. But even while every allowance may be made for the enthusiasm which Mr. Berg evinces for the electric drive, there can be no doubt that it has shown in practice that it possesses many marked advantages over the direct Diesel drive or the geared turbine drive, particularly for the propulsion of passenger liners. We have already commented favourably on the foresight shown by the directors of the P. & O. Co. in their choice of the electric drive for the *Viceroy of India*, and whilst awaiting performance data for this vessel—which, it is to be hoped, will soon be forthcoming—we may commend Mr. Eskil Berg's paper to shipowners who are contemplating the construction of new tonnage.

Mr. Marryat's Appeal for the Benevolent Fund.

The Electrical Trades Benevolent Institution has had a very warm place in our heart ever since it was formed. There is no more deserving fund in the electrical industry—its existence has enabled a helping hand to be held out just in a nick of time in hundreds of cases of distress; men and women have been relieved in the midst of the greatest anxieties that life can bring. But the actual need, even in this great industry of ours, is greater than can be met from the accumulated funds; surely nobody requires to be told to-day how painfully hard some of the cases are. The E.T.B.I. has been fortunate in the succession of presidents who have readily espoused the cause and issued strong appeals for funds. Mr. H. Marryat, M.I.E.E., whom we welcome as the latest of the splendid line of enthusiastic presidents, is eager to do a noble part by raising sufficient new capital to put the Fund on so solid a basis that it may be possible to grant pensions in cases in which totally incapacitated claimants already on the books, drawing small temporary relief which is renewed from time to time, shall receive a small pension enabling them to spend their remaining days in comfort in the country. To do this, he appeals in our "Correspondence" columns to-day for ten donors of £500, each to take up a vacant Vice-Presidency, 50 of £100, each to become a Life Governor, and others to subscribe £10 for life membership. By means of these and a generous addition to the general subscription list, Mr. Marryat would like the present capital fund to be advanced from £37,000 to £50,000. As he points out, claims are increasing every day. The industry, however, is growing rapidly too, and we earnestly direct attention to the president's appeal, commending it to the immediate practical interest and sympathy of everybody electrical.

It will be noted that, in the foregoing, stress is laid on the need for comparatively large donations, as it is by that means that the granting of pensions, so long the Fund's aspiration, may at last become a practical achievement. But if this matter appears in the forefront at the moment, it must not be supposed that the E.T.B.I. president and Executive have any less regard than usual for the smaller subscriptions and donations which we trust are in course of enthusiastic collection everywhere just now. Let the Marryat year be a memorable one!

Generation of Electricity in 1928-29.

As mentioned by us last week, the Electricity Commissioners have published their annual analyses and summaries of the returns of fuel consumption and kWh generated for the year ended March 31st, 1929; they are reviewed elsewhere in this issue.

The returns relate to 564 stations, including ten newly put into commission, and cover not only authorised undertakings but also railways, tramways, and certain non-statutory concerns. These stations generated 10,978,980,925 kWh (about 30 per cent. of which was accounted for in the London and Home Counties), an advance of 9.58 per cent. on the previous year, but the fuel consumed increased by only 3.66 per cent. In the period under review, 27 stations were permanently closed down.

The proportion of the total output produced by steam was 95.39 per cent., with an average fuel consumption per kWh of 2.05 lb. as against 2.16 lb. in the previous twelve months. The fuel consumption for all stations, converted where necessary to a coal basis, was reduced to 2.16 from 2.24 lb. per kWh. The highest thermal efficiency was, as might be expected, obtained by an oil-engine station, Lewes, with the figure of 28.89 per cent. for an output of something less than a million kWh, though this station was beaten by Buxton, also an oil-engine station, on the amount of fuel used (0.61 lb. per kWh). For steam stations the best results, both in thermal efficiency and lb. of coal per kWh, were secured by Padiham, 21.35 per cent. and 1.33 lb., respectively. Second in thermal efficiency was Barton (21.31 per cent. and 1.37 lb.), but North Tees in fuel consumption (21.19 per cent. and 1.35 lb.). Three other stations also

obtained thermal efficiencies exceeding 20 per cent., *viz.*, Ferrybridge, Barking, and Hartshead (Stalybridge). The load factors of these stations varied between 40.4 per cent. (Barking) and 50.5 per cent. (Ferrybridge). Barking had the greatest output of any station, approximately 400 million kWh.

In Table VI, the stations are grouped according to output; 11 stations generating about 20 per cent. of the total come under Class A and have an average fuel consumption of 1.73 lb. per kWh. There is a progressive increase in fuel consumption per kWh as the output decreases, with one exception in the smallest stations.

Perhaps the most notable feature of these returns is the occupation of the premier position by Padiham with an m.d. of 18,000 kW and an output of some 67 million kWh. This station was designed upon lines that might be considered old-fashioned, as it is without many of the aids to high thermal efficiency adopted in the case of the most modern stations. This is not to imply a doubt as to the efficacy of recent trends in power station design, but rather to give all the greater credit to the operating staff of the Lancashire Power Co.

Brighter Post Offices.

In the Electrical Review of February 1st, 1929, we ventured to offer criticism of the bad exterior lighting of the General Post Office—the entrance and exit steps and the posting boxes. We expressed regret that some of our biggest public buildings were still living in the dark ages. Anybody passing along King Edward Street in the early evening nowadays can see for himself the justice of our criticism. We had wondered whether we ought to entertain hopes of early improvement as it sometimes takes a long time in Government Departments to get official consent to alterations duly drawn up and authoritatively signed, sealed, and delivered to the executive parties, so that the work may be done. Possibly this particular matter is actually passing through these stages as we write. That something is happening "at the top" is obvious from the report that reached us on the wireless the other evening. Mr. Lees Smith, the Postmaster-General, was reported to have stated that a scheme for brightening Post Offices in all parts of the country was to be proceeded with. Incidentally, it would create employment. We welcome his pronouncement with enthusiasm, for better illumination is required in so many places, central and suburban, and above all we can hardly imagine that he will overlook the poor "General."

Competition for Electrical Contracts.

In these days when the importance of the South American market is being stressed so much, it is pleasing to hear of the success of a British concern in securing the important contract for the equipment of the new Buenos Aires underground railway. The psychological effect of this success should be of even greater benefit than the material results. It will be felt when many other schemes in South America are under consideration, for it has been shown that we can still meet Continental and American competition in that market which some would assert is turning away from us. The General Electric Co., Ltd., is to be congratulated upon securing an important part of the work, and we may assume that its strong local representation had a great deal to do with the company's success. Only a thorough understanding of the conditions, such an understanding as is secured by people "on the spot," can produce a scheme acceptable to those who have orders to place.

At about the same time as this contract was secured in the face of Continental and American tenderers, a New South Wales company was awarded a large order for batteries by a South African customer. *Reuter's* Agency reports that the Australian company was successful against keen English, German, and American competition.

This is an unusual instance, and we are not sure that any conclusions can be drawn from it, but it is interesting to place these two items side by side.

Skilled Labour in France.

We are informed that the supply of skilled labour in France continues to be insufficient to meet the industrial requirements, for in every important trade the demand is for more workmen. The shortage of capable solderers, winders, mechanics, and foundrymen, is particularly acute. In many districts these workmen have no difficulty in earning Fr. 50 to Fr. 60 per day of eight hours, or about 1s. to 1s. 3d. per hour. These rates, which are very high for France, are exceeded in many districts. Perhaps only in the case of casual labourers is the supply equal to the demand, for it is this class of worker which is deserting the country and flocking to the towns, to the great detriment of the most important French industry, the cultivation of the soil. It would certainly appear that the tendency is for France to become an industrial country, and this tendency is particularly apparent in the vast areas of agricultural land which, owing to the lack of suitable labour, have been abandoned. It is extraordinary that the situation in France from the standpoint of labour and labour supply should be so diametrically opposite to that which exists among her neighbours in England and Germany, but there is no doubt that the small population in France, in comparison with the size of the country, is largely responsible. At the present moment the French Government is passively allowing the immigration of skilled workmen, and during the first week of October the number of foreign workmen admitted amounted to 4,917. In view of our own economic and labour conditions this shortage of skilled workmen is of interest, particularly in view of the small distance that separates the two countries, but it may be observed that it is primarily essential for foreign workers in France to have at least an elementary knowledge of the language, if only for the sake of their own personal comfort. Unlike the Belgians, Italians, and Spaniards, of which nationalities there is a floating population in France of about a million representatives of each country, the British element is not sufficiently important to permit an Englishman to reside among his own countrymen.

Progress in Illumination.

The opening meeting of the 1929-30 session of the Illuminating Engineering Society was, as usual, devoted to a survey of progress made last season and exhibits illustrating improvements in illuminating engineering. The proceedings serve to show how the applications of artificial light are extending and how the movement is developing in other countries. With many of the inquiries noted therein members of the Society are associated, and it is closely linked with several other bodies which are conducting researches on illumination, such as the Illumination Research Committee, the National Illumination Committee, and the British Engineering Standards Association. Novel types of lighting fittings, stage-lighting equipment, and luminous traffic control signals figured amongst the exhibits. A particularly attractive item was the display of the "Kodacolour" film projector by Dr. Walter Clark.

After a successful year of office Mr. C. C. Paterson is retiring from the presidency, and the vacancy has been filled by Dr. J. W. T. Walsh. In the course of the proceedings it was announced that the Council had decided to form a Leon Gaster Memorial Fund, the interest on which will be applied mainly to the award of an annual premium for the best contribution furnished to the Society dealing with any aspect of illuminating engineering. We feel sure that no better method of preserving the memory of the founder of the Society could have been devised. No doubt the appeal will meet with a ready response from members, and it is probable that others of the many friends of the late Mr. Leon Gaster in the electrical industry may like to subscribe to the fund.

Small Hydro-electric Schemes.

Guiding notes for those contemplating the use of water power for electricity generation for country houses, estates, and villages.

By M. I. WILLIAMS-ELLIS, A.M.I.E.E., A.M.I.Mech.E., M.S.A.I.E.

THE need for supplies of electricity in isolated localities has within recent years brought about the production of many novel pieces of apparatus, and has at the same time caused a large number of engineers, architects, mechanics, and householders to become closely associated with the equipments that have been elaborated to fulfil this want. In this connection it has often been noticed that small internal-combustion sets have been bought "off the shelf," without giving the natural resources of the district any consideration with

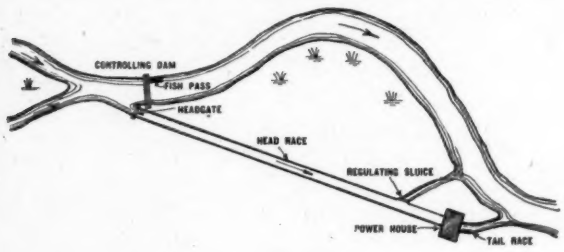


Fig. 1.—General Arrangement of Low-pressure Hydro-electric Scheme.

regard to the possibility of production of power from the small streams or ponds that may be available. In many cases this may be put down to the first capital cost, as there is little doubt in most cases that the cost of installing an oil-engine set as against a hydro-electric set is in favour of the former; but in any such oil-engine installation the case of the electric storage battery is a heavy item, not only in first cost, but also in repairs, renewals and attention.

Until recently water power offered comparatively little advantage in this respect over the oil engine, for, although the battery could generally be smaller, it was necessary to use one to maintain the steady voltage required for lighting; as, however, accurate and reliable governors have now been made applicable to small hydro-electric plant with very satisfactory results, batteries are no longer necessary. Guarantees are to-day given that the momentary rise of speed above the settled no-load speed, when the whole load is suddenly thrown off, will not exceed 2 per cent.

Too little consideration has, however, been given to the upkeep charges, running costs, and general depreciation, which are in favour of the hydro-electric scheme every time, provided the plant is, of course, of suitable construction and properly laid out, and on this a great deal depends. One may summarise the chief features of water power briefly as follows:—

(*a*) Low cost of maintenance is shown by the fact that a sinking fund of 2½ per cent. per annum of the capital value of the plant is an ample allowance to make for this charge.

(*b*) Simplicity is a great feature and, compared with any form of heat engine, the simplicity of construction of a water turbine, Pelton wheel, or an overshot water-wheel is most marked; there is no difficulty in starting, it can be accomplished in the majority of cases in a few seconds.

(*c*) The absence of a fuel bill is the greatest and most obvious advantage of water power; moreover, compared with other forms of prime movers, the lubricating oil and grease required for hydro-electric plant is very small.

(*d*) The labour required for ordinary water-power plant in out of the way districts is usually unskilled, and for small installations such as those under review the attendance required in many cases can be reduced to a visit every 24 hours; sets have been in operation for weeks without attendance, but this is not recommended.

As the conditions of water-power schemes vary so widely, the type of plant to be used has also to be varied. Neglecting the old type of water wheel, one may place the two classes used as distinct: (1) re-action turbines (Francis and axial types); (2) impulse turbines (Pelton and impulse types). The former are suitable for falls up to, say, 150 ft., *i.e.*, for low and medium falls, and the latter are suitable for falls of 150 ft. upwards, but may often be advantageously used for falls as low as 30 ft. when the power required is small. Generally speaking, the type of turbine to be used will be determined by the conditions at the site. For relatively low falls up to, say, 15 or 18 ft. on small-power turbines, the open (uncased) type of turbine will usually be the most economical. For large-power turbines the open type may be economically used with falls up to 30 ft., or sometimes even higher; but for medium or high falls a cased type of machine is essential. A typical general arrangement of a low-pressure scheme is shown in fig. 1. In all cases in which a medium or high fall is available, careful consideration should be given to the desirability of installing an impulse-type turbine.

One of the chief troubles met with by users of small water-power plant is the periodical clogging of the strainer plates at the time of the year when the stream or river is bringing down large quantities of leaves,

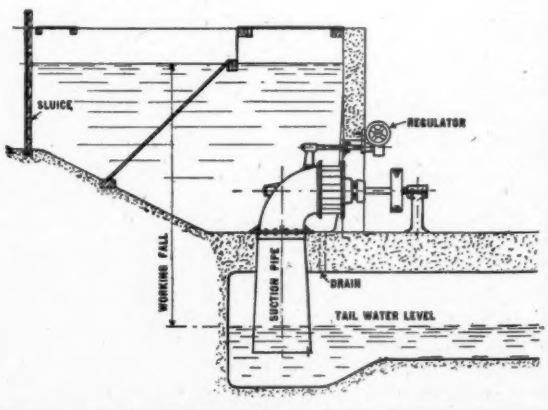


Fig. 2.—Horizontal Turbine with Right-angle Suction.

peat, sticks, &c., so that it often means cleaning the screens by hand. Messrs. Gilbert Gilkes & Co., Ltd., have placed upon the market a very simple device for the cleaning of screens by hydro-mechanical means, the mechanical portion being operated by a small water wheel or by an electric motor. The operation depends on the difference in level between upstream and downstream sides of the strainer plates, and the actual removal of the leaves, &c., from the strainer is effected by

suction through a pipe or pipes operating on a pivot in front of the screen. When, owing to the accumulation of leaves on the strainers, the water on the upstream side

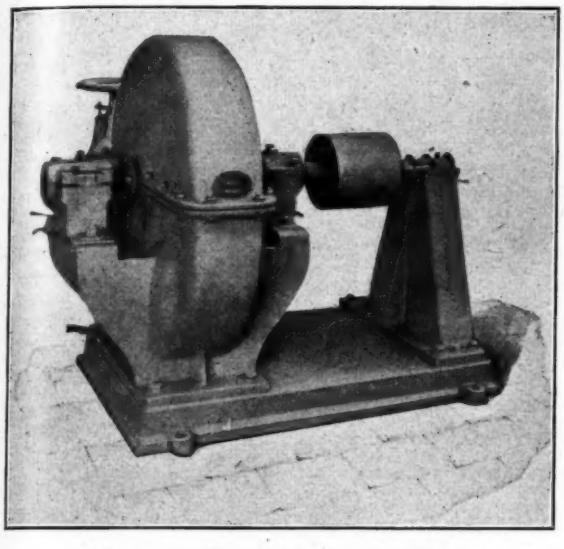


Fig. 3.—Pelton Wheel for Belt Drive.

is higher than that on the downstream side, the motor comes into operation, and the suction nozzles travel up and down over the strainer plates until the leaves, &c., have been removed. Equilibrium is then again established between the two sides of the strainers, and the motor automatically stops. The motor is stopped when the nozzles are in their "out of water" position, so that there is no unnecessary waste of water.

The construction of dams in connection with even small water-power plant is all important, but much depends on the situation, and one can find cases in which the dam may cost, say, only £30 to construct, and others wherein the cost is as much as £300 to get the same power. It greatly depends on whether the water is impounded or not. In some cases small lakes or reservoirs have to be specially constructed to store the water, as the normal supply from the stream would not be enough for the usual requirements at any given time. There are other cases in which the supply all the year round from a stream is ample for the requirements, and in such cases it is only necessary to construct a small controlling dam across the stream, so as to divert the required amount of water along a pipe or flume. In the construction of dams, however small, great care should be given to the design, and to see that a proper foundation is obtained, and that naturally they are watertight, as a small leak might seriously affect the strength of the dam.

Such dams are usually built up of masonry and have concrete cores, or, as in the cases of many small lakes, they are sometimes of earth with a stone pitching and clay, peat or bitumen core, or, again, the lake side of the dam may be lined with a bitumen sheeting with a cement facing. Dams across streams have to be designed to allow for the full volume of water to pass in the case of heavy floods, without interfering with the normal supply to the turbines, while often special arrangements have to be made to allow fish to pass up the stream or river through or over the dam by means of fish ladders, &c.

In the case of river dams it is the writer's experience that it is most important to arrange for special sluices to be constructed at the bottoms of the dams to allow for the periodical washing out of silt, &c., which otherwise is liable to fill up to the top of the dam in time, possibly causing serious trouble to the turbines and loss of impounded water space, while in many cases it is necessary to allow for compensation water to pass.

Fig. 2 shows a practically standard horizontal-shaft turbine with the addition of a right-angle suction bend. This eliminates the use of bevel gearing, and for electrical work permits direct coupling to horizontal-shaft generators; in this case it is shown for a belt drive. Fig. 4 shows the efficiency curve of a Gilkes "Francis" turbine.

The Pelton wheel is the simplest and the most efficient form of water motor. Fig. 3 shows a small Pelton wheel arranged for belt drive. This is used in place of the re-action type when the head is relatively high and the quantity of water relatively low, and is therefore always used in conjunction with a pipe line. There is a number of different designs and arrangements to suit the varying conditions which occur in practice. Fig. 5 shows a Pelton wheel with a shaft governor and directly coupled generator supplied by Messrs. Gilbert Gilkes, operating on a head of 215 ft.

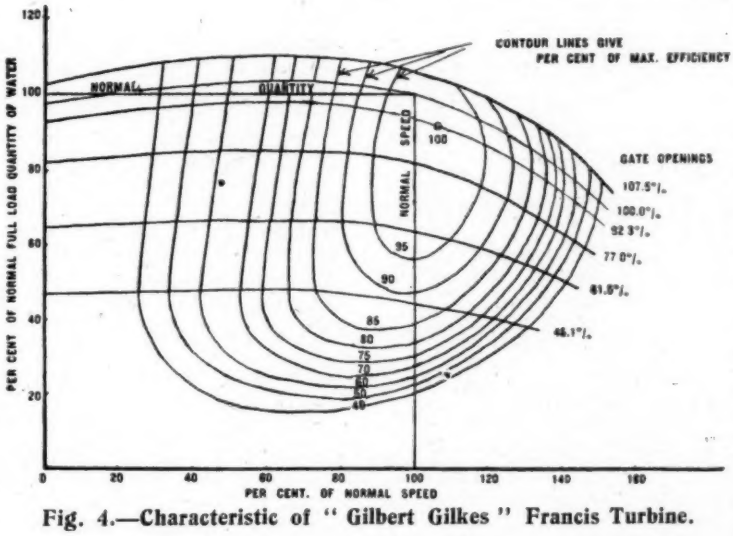


Fig. 4.—Characteristic of "Gilbert Gilkes" Francis Turbine.

To meet the requirements of many hydraulic engineers, Messrs. Gilbert Gilkes have designed and placed on the market a turbine known as the "Turgo" impulse wheel. Fig. 6 shows a "Turgo" wheel set complete, which has a capacity intermediate between that of the Pelton wheel and the low-capacity re-action turbine. Many situations were found

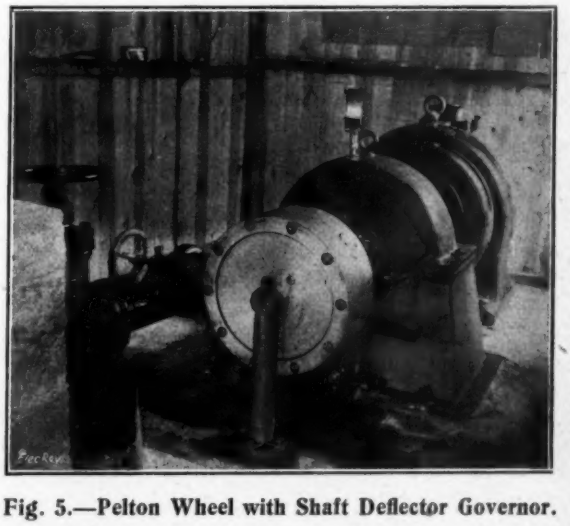


Fig. 5.—Pelton Wheel with Shaft Deflector Governor.

where the Pelton wheel would run too slowly, but where the re-action turbine, with its less perfect speed regulation and rather delicate wearing parts, was unsuitable.

This wheel has all the simplicity of, and is exactly similar to, the Pelton wheel in so far as the jet is concerned, and

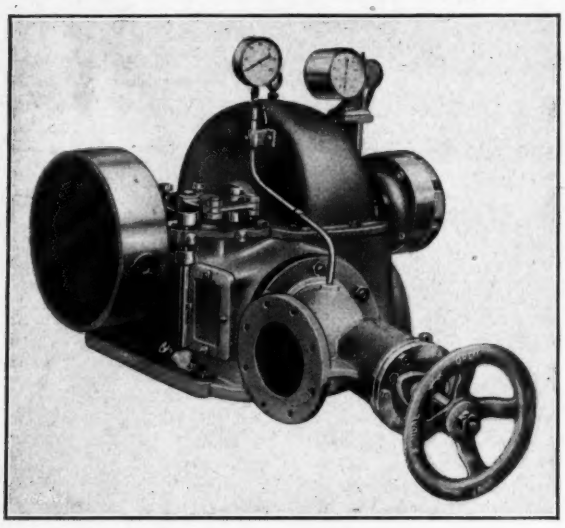


Fig. 6.—Complete " Turgo " Wheel Set.

like the Pelton it is a pure impulse or " free deviation " wheel. Many of these sets are being installed to-day with highly satisfactory results for rural and country-house lighting schemes and general industrial work. Fig. 7 shows the inlet (left) and outlet (right) sides of a " Turgo " impulse wheel.

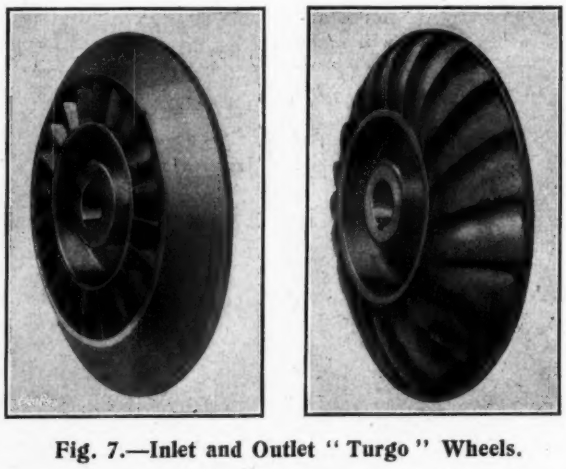


Fig. 7.—Inlet and Outlet " Turgo " Wheels.

Figs. 8, 9 and 10 depict sections of a low-pressure hydro-electric plant as carried out by the West Wales Electric Co. for an estate in North Wales. Fig. 8 is the tail race and power house; fig. 9 is the turbine in position in the wheel pit; and fig. 10 is the controlling dam across the river. The voltage in this case is controlled by an automatic Cox Walker " Reed Controller." The turbine was supplied by Messrs. Armfields, Ltd. An interesting installation consists of two sets of " Turgo " wheels directly coupled to alternators in operation at Cynwyd, North Wales, the larger being 21 in. in diameter and the smaller 12 in. The former is capable of developing 150 b.h.p., and the latter 27 b.h.p. The alternators have outputs of 112.5 kVA and 20 kVA, respectively. Special attention has been paid to the matter of governing. Each turbine has a shaft governor operating a deflector, combined with an overtaking gear which, on a sudden change of load, gradually varies the quantity of water passing through the nozzle. The working head of water in this case is 210 ft., and is led down to the power house in 18-in. riveted steel pipes. Superior speed regulation and the part-gate economy of this type of turbine will frequently weight the balance in its favour, compared with a re-action turbine.

The development of water power for small towns or estate power supply purposes requires very careful study owing to the large variations which usually occur in connection with the small rivers or streams which supply the power. If the best results are to be obtained, it is quite essential that the most suitable type of plant is installed, and it is rarely possible to use standard arrangements. These sets can either work directly on the electricity mains under the control of an oil-pressure governor, or through batteries, when a governor may not be essential in certain cases.

It is quite satisfactory to work directly on the mains, provided there is sufficient water to meet the demand. Batteries only become necessary when the demand exceeds the continuous power available. Turbines are usually arranged for horizontal running, but in some cases it is necessary to arrange for vertical running, owing to locality, building or pit arrangements, &c., and so far as the cost of the turbine itself goes it is the cheapest arrangement. The turbine is a simple type specially suited for heads up to 20 ft.; it is mounted on the suction tube, which can be either of steel or concrete. With small power installations, say, up to 15 b.h.p., the power may be transmitted from the pulley on the vertical shaft to the generator by means of a quarter-twist belt drive. With larger units the transmission is usually effected by bevel gearing, the design of which varies considerably with the work to be performed. With a reasonably high speed, a satisfactory arrangement is to couple the turbine shaft directly to the vertical generator. This combination reduces building costs to the minimum, and ensures very silent running and the minimum of upkeep. The total weight of the revolving parts, including that of the turbine runner, is taken by means of a thrust bearing, usually situated on the top of the generator frame. A typical vertical-shaft arrangement is shown in fig. 11; although a portion of the turbine pit of this installation is shown made of timber, the writer is very much more in favour of concrete for all this work.

Generators are usually directly coupled to the turbine shafts by means of solid half-couplings or flexible couplings, but if it is a case of keeping the cost within limits they are often belt driven, as in that case the speed of the generators can be kept high.

Pipe lines are sometimes laid out for low heads in reinforced concrete, which gives satisfactory results provided the lines are carefully designed and proper attention is given to allow for contraction and expansion. Iron pipes, however, are more generally used, the size of the pipe being so calculated that no undue proportion of the head is lost in friction, and also that no unreasonable outlay is incurred. The pipes themselves are laid on the surface of the ground, in the ground, or

Fig. 8.—Tail Race and Power House.

on supports, much depending on the nature of the ground to be traversed. Proper provision in every case should be made for anchoring a pipe line, particularly

at the bends. The joints in the case of small power schemes are usually of the socket and spigot type, or flanged in the case of riveted pipes. The most economical size of pipe line is that for which the annual value of the energy wasted, due to friction loss, is approximately equal to the annual interest on the investment. An average value for allowable loss of head due to friction

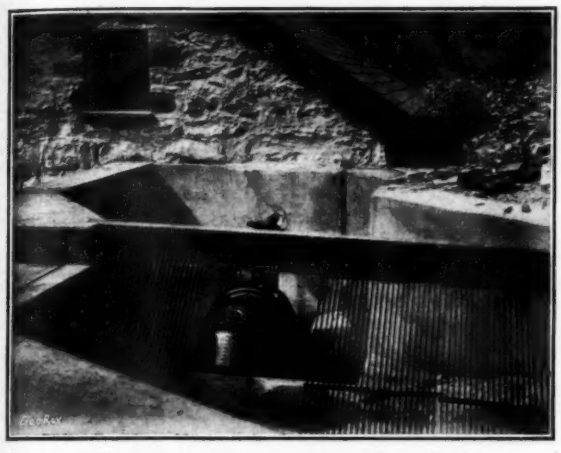


Fig. 9.—Turbine in Wheel Pit.

to comply with this law is from 3 per cent. to 7 per cent. In connection with head races for low-pressure turbines, their cross-section area is most important with very low falls, where only a few inches will make quite a considerable difference to the horse-power available. The velocity of water in such cases should not exceed 2 ft. per second.

It may be of interest to give a few typical examples that have been worked out of the annual costs of some

TABLE I.

	Per annum. £ s. d.
Anthracite for gas engine	200 0 0
Oil, waste, and sundries for gas engines	20 0 0
Battery repairs and depreciation	70 0 0
Repairs to gas engine and plant	50 0 0
Attendance on gas engine and electric plant and estate machinery (two men and boy)	325 0 0
Coal and coke for cooking, hot water, and central heating	140 0 0
Total	£785 0 0

small hydro-electric installations as installed by Messrs. Armfields, Ringwood, the figures of £7 12s. 9d. per

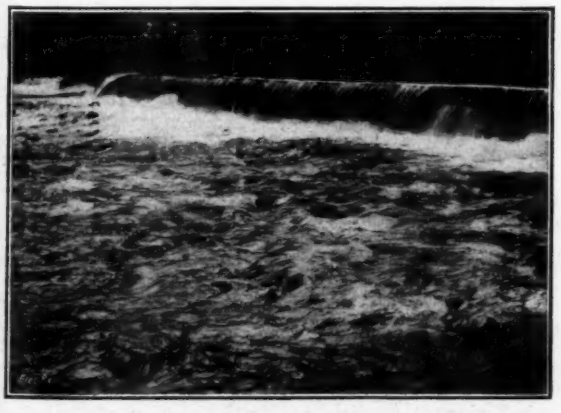


Fig. 10.—Controlling Dam Across River.

cent. per annum having been taken to cover interest and depreciation. This figure is one on which the Lands Improvement Co. is prepared to advance loans for such schemes, and provides for repayment in 20 years. As the life of hydro-electric plant is certainly much greater than 20 years, the figure is a very conservative one.

TABLE II.

Two 40-b.h.p. hydro-electric generating sets:—

Capital cost	£4,325
Less sale value of old plant	420
	£3,905

	Per annum. £ s. d.
Interest and depreciation	236 0 0
Attendance on estate machinery (1 man and boy)	175 0 0
Oil, waste, and sundries	5 0 0
Total	£478 0 0
Less saving in domestic labour (1 maid and boy)	£105 0 0
Balance	£375 0 0
Advantage in favour of conversion	£412 0 0

Consumption: 200,000 units per annum; cost per unit, 0.575d.

TABLE III.

The oil-engine costs were:—

Coal for range	£72 0 0
Petrol and paraffin for engine	42 0 0
Battery repairs	15 0 0
Engine	8 0 0
Oil, waste and sundries	5 0 0
Attendance (average 2½ hours per day)	54 0 0
Total	£196 0 0

The hydro-electric costs were:—

Cost, including layout of pipes, intake works foundations, overhead transmission line, electric cooker and water heater	£725 0 0
Less sale price of oil-engine set	70 0 0
	£655 0 0
Interest and depreciation	£50 0 0
Oil, waste, and sundries	2 0 0
Repairs	3 0 0
Attendance	9 0 0
	£64 0 0
Less saving in domestic labour	£60 0 0
	£4 0 0
Advantage in favour of a hydro-electric plant	£192 0 0

Consumption: 45,000 units per annum; cost per unit, 0.375d.

Example 1: *Country House and Estate.*—In this case a river with a slight fall passes through the estate. The approximate requirements were as follows:—

Lighting, 350 points; pumping, 2,000 gal. per day; sawing (average), 25 b.h.p., 6 hours per day, 3 months per year; refrigerator, 2 b.h.p., 4 to 8 hours per day; sundry motors for farm work, &c. (average), 2 b.h.p., 8 hours per day; cooking; hot water for domestic supply; and central heating.

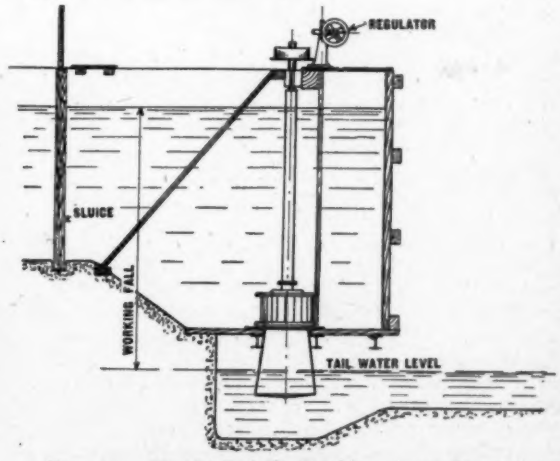


Fig. 11.—Vertical-shaft Turbine Arrangement.

There had been installed two suction gas plants, each of 30 b.h.p., and the cost of running them, together with the coal for domestic purposes, worked out as in Tables I and II.

A hydro-electric plant was installed on a fall of 3 ft. 6 in. Two turbines of 40 b.h.p. each were installed, each with governor and generator. In the following

comparative figures, no general depreciation or interest has been allowed on the old plant, but its sale value has been credited as part payment for the hydro-electric plant.

Example 2: *Country House, Used as Boarding Establishment.*—An old-engine set had been installed, and the house wired for 120 lighting points; an ordinary coal range, with a back boiler for domestic water supply, was used.

A small stream was available, with a fall of 25 ft. in a distance of about 150 yards. A large pond was also available from which the water was conveyed in concrete pipes to the site of the hydro-electric generating plant. An enclosed-type turbine of 15 b.h.p. was installed, together with the necessary generator and governor, the electricity being taken a distance of 250 yards to the house by overhead cables.

The data for this example are given in Table III.

Rural Electrical Development.

Some difficulties and a few suggestions for overcoming them, remembering that there is room for co-operation between those who desire to preserve the rural aspect of the countryside and those who are attempting to provide it with cheap power.

By W. FENNELL, M.I.E.E.

(*Concluded from page* 647.)

We in England were regulated out of the air into the earth very early (1882) and there we stayed until, painfully and slowly as a result of agitation, it was agreed that the stringency of Overhead Line Regulations should be reduced. We then fell into the hands of a Committee which, about five years ago, calculated the strength of overhead work as a beautiful theoretical problem in statics. It made assumptions, based upon the climate of Canada, in relation to ice loading, &c., and applied them to lines of all classes in our humid climate. As a result it is nortorious that ours is the one country in which truly rural development is impossibly expensive, because we are being forced to put up unnecessarily strong and expensive overhead h.p. secondary lines. Is there any real difference between the climate of England and that of North-Western France, or the warmer parts of the U.S.A., which makes what is safe there dangerous here? The happy solution of the foreigner and our unhappy lack of solution of this problem are, the writer believes, due to the fact that the foreigner was allowed to adopt the method of trial and error, and the result is something which, over a long period, has shown itself to be strong enough for his conditions. The method of trial and error, which the highbrow calls rule of thumb, has beaten the method of stress calculations because it is not based upon inaccurate assumptions for sub-arctic conditions, but upon experience.

The writer suggests that, as national funds are to be spent on rural experiments, it would be good policy to erect some dummy lines of strengths graded from those stipulated in the present Regulations downwards and see what happens to them in England. Ten miles of such lines in an exposed place, say on a Lancashire moor subject to westerly gales, for a year or two, and costing, say, £2,000, would provide a real basis for British regulations.

There is a matter of procedure that requires serious discussion at the present time. The 1919 Electricity Act dispenses with the veto of the local authority and substitutes " a right of being heard " before the Ministry of Transport sanctions overhead work. The practice was, and is, to require the undertakers to apply for sanction for each individual line from the Electricity Commissioners and the M. of T., and to produce the approval of the local authorities. If the latter is refused, there is a local inquiry, which takes several months to arrange. This procedure was designed for a time when overhead work was exceptional and infrequent. Matters have now progressed so far that large areas are being developed gradually and entirely by overhead work, and the result of this method is disheartening to those engaged in it, because it keeps agitation alive and delays each extension. The writer suggests earnestly that every undertaker should be enabled to obtain consideration of a general sanction for overhead development of an area by depositing a plan, and that the local authority be heard as to the area instead of as to each separate line. The Commissioners could then recommend consent, subject to approval by them of construction methods, for those portions of the area where they are satisfied that overhead work must be used, and retain the method of individual application for doubtful portions. This suggested method would comply with the Act just as completely as the present method, and would ease the work of the Commissioner's staff and so save expense, while avoiding delay. The present methods will be absurd for, say, the Lincolnshire scheme, and the suggested method might be tried out at Bedford forthwith.

In putting forward the above proposal the writer may mention that he inserted a clause to effect this in the Mid-Cheshire Draft (1924) Order, but it was deleted by the Ministry of Transport. Since that date almost the whole of the suggested overhead area has been developed by overhead lines, but dozens of separate applications have had to be made to local authorities, and some have been delayed six months and even longer, to the great inconvenience of the public, but no application has been refused. The writer's company is now applying for an extension order for an area of 40 sq. miles to be developed entirely by overhead work, and many others are, or will be, in a similar position.

The writer feels he must issue a serious warning against what he observes to be the usual practice in dealing with outer suburban " ribbon building " work, *viz.*, that of erecting long 400-V, 4-wire, distributing mains of about 0.05 sq. inch area supplied through a sub-station. Such lines will be the very worst advertisement possible for electricity supply. As soon as even a few consumers use electricity for cooking and heating on such a line a serious voltage-regulation crisis will arrive. Rural work means high-pressure work (almost up to the consumer) and the compound line, *i.e.*, high- and low-pressure conductors on the one pole, is a solution of the problem of ribbon building. We cannot, how-

ever, carry out high-pressure house-to-house distribution in rural England on an economic basis, unless the High-pressure Regulations are eased, so the authorities have to choose between following the example of the Government as to light railways, or of seeing a system established which will only deal with lighting in rural areas at a time when everyone knows that electric cooking, heating, and power are needed quite as much as lighting, and will be demanded.

With regard to the thorny subject of wayleaves, it is always much easier to deal with it when the "rural amenities" issue is not to the fore. The Electricity Commissioners are doing what they can within the limitations of the Act, the intent of which is to a great extent defeated by the ponderous procedure which was attached to it. No one dare apply Section 22/1919 unless he is willing to risk waiting from three to six months for a decision under it, and spending an amount equal to from 20 to 100 years' purchase of the wayleave rental demanded in obtaining a reduction of that rent. This would be humorous if it were not tragic.

The recent issue of an elaborate draft wayleave form unfortunately offers little hope of assistance, unless it can be cut down to a simple consent with a few short clauses indicating the obvious facts that the undertakers take all risk, pay for all damage, and are carrying out a public service, which must not be looked upon as an additional source of unearned rent to the landowner. We cannot be expected to pay for "moral and intellectual damage" by reason of the line, unless the owner is also prepared to hand over the unearned increment he may obtain by reason of the increased value of his property following from the provision (without cost to himself) of electric light and power on tap. As soon as the mains are erected one sees in advertisements for local land and property sales "electric light available on the estate." The least that can be done in return for this is the offer of nominal wayleave rentals.

The writer wishes to say in conclusion that there are local authorities which welcome overhead lines, landowners who recognise their responsibilities as such to their tenants, and to their neighbours who cannot afford private plant, and farmers who send in reasonable claims for damage done. It is a pleasure to deal with them and a duty to see that their confidence is rewarded by every form of consideration from us in carrying out our works. This article therefore ends on the cheerful note that we must be thankful for small mercies and work so that "the little leaven leaveneth the whole lump."

Electricity for the Home.

Evidence of Progress in Domestic Electrification at Kingston and Brighton.

KINGSTON-ON-THAMES (engineer and manager Mr. T. A. Kingham) is another undertaking which has approached the domestic-electrification problem with zeal. One of the most interesting points in connection with this undertaking is that no two-part tariff is in vogue. There is a flat rate of 5d. per unit for lighting and ¾d. per unit for other domestic purposes. Out of a total of 170 cookers now out on the mains, 68 were installed last year. "Magnet" cookers seem to be very popular at Kingston.

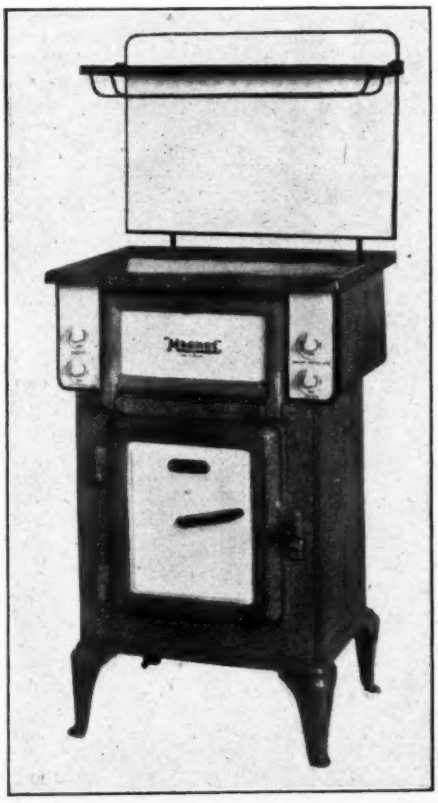


Fig. 1.—"Magnet" Cooker (D.C. 5746) which is Popular at Kingston.

There are at the present time considerably over 100 cookers made by the General Electric Co., Ltd., in use by consumers under the Kingston-on-Thames electricity undertaking. These cookers are of the d.c. 5,760 and d.c. 5,746 types, fitted with oven thermometers, plate racks and white enamelled splashguards. They are identical in the principal points of their construction, the ovens being fitted with side, or side and bottom heat, and enamelled interiors rounded at all the corners, which are entirely withdrawable for cleaning purposes. The important differences in design apply mainly to the dimensions and capacity of the ovens and hotplates. The larger of the two types, d.c. 5,746, fig. 1, is intended for a household up to six persons, and the d.c. 5,760 for four persons. A particular feature of the latter is that, though small, it is nevertheless complete in equipment and embodies an oven, grill, and totally

Fig. 2.—"Inventum" Fire, Sheet-metal type used at Kingston.

enclosed hotplates, all arranged for three degrees of heat and separately controlled. The illustration shows the model in the de luxe finish, and it will be seen that the grill is fitted between the oven and the hob, but in the d.c. 5,746 model the grilling outfit is fitted within a large hot cupboard and can be completely withdrawn when the cupboard is required for warming plates, &c. The standard finish provides for a porcelain hob enamelled mottled grey, with the exterior, including facings and feet, in black stoved enamel; the removable

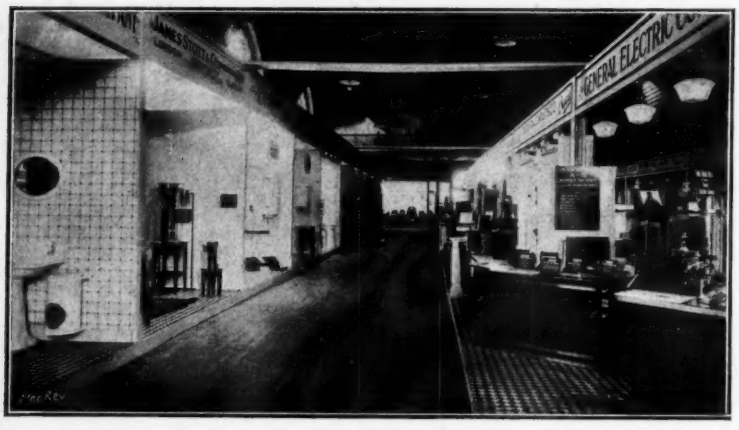


Fig. 3.—A View of the Water-heating Section at Brighton Exhibition.

oven interiors are of enamelled porcelain, and the oven door and switch panels enamelled white.

There is evidently a big demand for electric fires at Kingston. Out of a total of 373 radiators connected to the main at the end of the financial year, 207 were put out last year, mostly on hire. " Inventum " fires of the type shown in fig. 2 are largely used. This is the 3-bar sheet-metal fire.

The elements are of the plug-in type, and the actual heating coils are supported throughout their entire length. Ample room is provided for contraction or expansion. A number of finishes can be obtained, and the fire is supplied with either of two loadings, 1,500 W or 2,100 W. The weight is 11 lb. Bronze or brass reflectors are usually supplied, but the fires in heavy type can be provided with chromium-plated reflectors.

Kingston offers all types of " Inventum " water heaters, in addition to other makes; for the kitchen they recommend the 1½-gallon 454 heater, and for the bathroom the 455a heater of 10-gallon capacity and upwards. The inner tinned copper container and outer galvanised-iron casing, with shredded cork lagging in between, the sheathed immersion elements and automatic switch (thermostat), &c., are features of the apparatus by Inventum, Ltd. An important provision is that the whole of the internal components, including inlet and outlet pipes, are mounted on a detachable base. They can be removed bodily simply by undoing the flange fixing bolts. This greatly facilitates internal inspection and cleaning. A single cock, or tap, only is required to be fitted on the cold water inlet pipe. When this tap is opened cold water flows in and automatically displaces a corresponding quantity of hot water through the outlet pipe. Turning off the cold water supply causes the flow of hot water to cease. The cistern thus operates on the push-through principle.

Since water expands on heating, a small amount would be forced over the top of the outlet pipe and result in a continuous dripping as the freshly-introduced cold water is heated up, unless means to prevent this were provided. This source of irritation is entirely overcome by the " Inventum " patented non-drip device.

At the end of March last there were 190 kettles, 247 irons, and 33 water heaters hired out by the undertaking. The hire charges for cookers vary from 7s. 6d. to 12s. per quarter, including a thermometer and a 3-pint kettle. Radiators are hired out at from 2s. 6d. to 5s. per quarter, and water heaters at from 3s. 6d. to 9s. per quarter. Cookers are wired free up to 60 ft. The undertaking does its own repairs, and, as has been experienced by most undertakings, the maintenance costs have proved very low as the result of using closed-type boiling plates. A psychological point which is experienced by the department is that non-cooking consumers are " afraid " of electricity; they won't believe the heat is there because they cannot see it. There are very few dissatisfied consumers nowadays, and the old complaints about the time required for boiling plates to get hot seem to have been straightened out by the inclusion of an electric kettle as part of each cooker.

Gas at Kingston is 10d. per therm, and after conversion from gas to electricity for cooking or heating, consumers do not find their bills increased. There are a few all-electric houses, except one coal fire, on the Kingston system, and the meter readings given are a typical example of the consumption for an " all-electric " consumer with a normal family. The readings are: June quarter, 802 units; September, 785 units; December, 680; and March, 1,055 units.

Naturally consumers prefer new cookers, and the installation of renovated or used apparatus presents a problem. The undertaking seems to have overcome this in an excellent manner: new cookers are hired out on a three-years' agreement only, and old ones are sent out on agreement for one year.

The Brighton Exhibition.

That Brighton Corporation Electricity Department appreciates the importance of the domestic load was demonstrated by the opening by the Mayor (Alderman H. J. Galliers, J.P.) on October 10th, at the Dome and Corn Exchange, of an electrical exhibition. The latest effort was by far the largest and most impressive, and, with the assistance of the Electrical Development Asso-

Fig. 4.—The Heating and Cooking Section: A Representative Display.

ciation, resulted in a marked advance on previous displays.

The exhibition was divided into four main sections, *viz.*, water heating, heavy appliances, lighting and miscellaneous, and a large hotel demonstration kitchen and restaurant catering for the full requirements of the stall holders and the public, serving luncheons, teas and dinners.

One of the chief features of the show was the water-heating section, which set up a new standard for exhi-

bitions of this description. This section was of an exceptionally representative character, combining apparatus by the whole of the manufacturers of electric water heaters. Similarly, the heavy-appliances section consisted of an unusually large display of cooking appliances by all the recognised manufacturers. Heating was also represented by all the principal manufacturers, and in addition to the radiant heat and imitation coal fires, included a display of low-temperature tubular heaters which are now becoming very popular for use in large buildings. The feature of the lighting section was the almost general display of anti-glare fittings which are now recognised as the most efficient means of illumination. This system of illumination was emphasised by the Electric Lamp Manufacturers' Association whose stand included models of interiors of rooms and workshops in which the old and new ways of lighting were effectively contrasted.

The Electrical Development Association adopted an attractive method of educating visitors in the uses and advantages of electrical appliances in the home, which proved very popular. It gave a series of spectacular electrical tableau demonstrations consisting of simple wordless plays, which introduced domestic appliances in the ordinary routine of the housewife.

The Corporation Electricity Department was content to leave the display of appliances to the rest of the exhibitors, and its stand served as an inquiry bureau where visitors were furnished with particulars of charges and were given expert advice with regard to proposed installations.

A new 15,625-kW turbo-alternator was inaugurated by the Mayoress at the Southwick power station on October 12th, bringing the capacity of the undertaking up to 40,425 kW. The maximum load on the generating plant last year reached 18,700 kW, so that with a population of over 140,000, of which at March 31st last 19,694 were consumers, it will be seen that the undertaking has both scope for domestic development, and sufficient plant to meet requirements for some time to come.

In addition to the E.D.A., E.L.M.A., and the Corporation Electricity Department, the exhibitors included the following:—Siemens Electric Lamps & Supplies, Ltd.; James Scott (Engineers) & Co., Ltd.; Electric Fires (Norwich), Ltd.; Carron Company; General Electric Co., Ltd.; H. J. Galliers; Jackson Electric Stove Co., Ltd.; Belling & Co.; Drake & Gorham Wholesale, Ltd.; Page & Miles, Ltd.; Koldah Cooling Machines, Ltd.; Berry's Electric (1928), Ltd.; Electrolux, Ltd.; Ferranti, Ltd.; Moffats, Ltd.; Metro-Vick Supplies; Hotpoint Electric Appliance Co., Ltd.; E. E. Fellingham; Sadia, Ltd.; Credenda Conduits Co., Ltd.; Revo Electric Co., Ltd.; Young, Osmond and Young, Ltd.; Edison Swan Electric Co., Ltd.; Santon, Ltd.; and A. Reyrolle & Co., Ltd.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A Compact Testing Set.

Messrs. Ferranti, Ltd., Hollinwood, Lancashire, have recently announced the introduction of an unusually compact multi-range d.c. testing set, fig. 1. Although of a convenient size for carrying in the coat pocket, this instrument is adequate for any type of d.c. test, having self-contained ranges from 0-1 milliampere to 0-25 amperes, and from 0-10 millivolts to 0-250 volts. B.S.S. first-grade accuracy is obtained, it is

Fig. 1.—" Ferranti " Multi-Range Test Set.

claimed, on all ranges, and, when required, an additional range of 0-500 volts can be obtained by the use of a small external resistance box, or a self-contained instrument reading up to 600 volts can be supplied. In addition, a terminal is provided for the use of any standard external shunt, thus extending the ampere range indefinitely. Replaceable cartridge fuses protect each movement, the movements being independent of each other, thus allowing of simultaneous readings of voltage and current. For workshop or outside service tests where a compact, robust instrument is required, this testing set is useful, having been designed to be as nearly universal as is possible in so small a compass, whilst maintaining a high standard of robustness. Mirror scales ensure great accuracy of reading, making the instrument eminently suitable for precision readings in laboratories and test-rooms.

A Small Motor-Starting Switch.

The accompanying illustration, fig. 2, is of the d.p. " Twinob " single-phase, motor-starting switch recently introduced by Messrs. A. P. Lundberg & Sons, 477 to 489, Liverpool Road, Holloway, N.7. It has been specially designed for starting single-phase motors by what is known as the split-phase method, with the starting and running windings in parallel to start the motor, the former being only in circuit temporarily. The new double-pole construction embodied pro-

Fig. 2.—The D.P. " Twinob."

vides for the isolation of the motor circuit from the supply. A cover of brown bakelite is fitted, and this is designed for a recessed knob. The hooded lever is under the control of a spring, *i.e.*, it returns to its normal or off position when pressure on the hood is removed. This spring-controlled lever encloses the other, and carries it along with it when pressed. On release of the pressure, that is, when the motor has started properly, the hooded lever returns to its normal " off " position, thus cutting the " starting " winding of the stator out of circuit. The other lever, remaining in its " on " position, controls the running winding, the motor being stopped when it is thrown into its off position. The current to the motor is broken on *both* poles.

A Metal-Coating Process.

By means of apparatus introduced by Metals Coating Co., Ltd., 22, Birchin Lane, E.C., it is claimed to be possible to apply an exceptionally durable coating of any commercial metal upon any other metallic or non-metallic surface. Metallic coatings may also be applied to non-metallic materials such as wood, stone, brick, glass, porcelain, concrete, leather, and fabrics. The thickness of the coating may be varied, according to requirements, from 0.001 inch up. The metal to be deposited is used in the form of ordinary commercial wire, and any metal that can be drawn into wire can be used. The wire enters the tool at the rear, is fed automatically from a reel through the nozzle and into contact with an oxy-acetylene flame which melts the wire and, in combination with compressed air, blows the atomised metal against the surface, being coated at a velocity of about 3,000 ft. per second. The metal, as it impinges against the surface at this high velocity, solidifies and practically becomes an integral part of the surface. The tool weighs only 3½ lb., and is manipulated by hand for most work.

An Improved Radiator Heater.

No. 3 model "Peter the Heater" is a combined inspection lamp and automobile radiator heater recently introduced by Messrs. L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, W.C.2. The article is constructed in the form of a lantern, with the heater in the hood, and equipped with an efficient portable inspection lamp, reflector and a hinged wire-guard protector. Hook suspension is provided for hanging the apparatus under the bonnet. Switch control—"lamp," "off," and "heat"—is arranged in the base of the lamp. The device is supplied complete with a length of three-core workshop flexible cord.

"Rockbestos" Products.

As we recently announced, British Insulated Cables, Ltd., has taken up the sale and manufacture of "Rockbestos" products in this country. "Rockbestos," the asbestos-covered wire, is made by processes involving the use of special machinery and should not be confused with ordinary wires taped or braided with asbestos. In the "Rockbestos" process the insulation is composed of pure, long-fibred asbestos, thoroughly separated, carded and spun into a yarn or roving which is wound uniformly upon the conductor, saturated, except in the case of heater cords, with a chemically neutral compound and submitted to a polishing process which finishes and consolidates the insulation. The colour of the insulation may be white or black, depending upon requirements. Black compound is used in all cases where moisture may be present, and white compound where heat is intense and moisture is absent. "Rockbestos" insulated wires and cables have a very wide field of application in heating apparatus of all kinds, windings for industrial motors, cables for power stations, switchboards, motor controllers for power and traction, electric furnaces, kinematograph and other arc lamps, &c., where their heat-resisting and flameproof qualities are an insurance against breakdown through accidental overloads and against fire. "Rockbestos" covered wire will run red hot and still remain capable of service.

"Personal" Salesmanship.

The First E.D.A. Conference of the 1929-30 Session.

THE 1929-30 series of Salesmanship Conferences organised by the British Electrical Development Association in London was opened at the Royal Society of Arts on October 18th, when Sir Andrew Duncan (Chairman of the Central Electricity Board) was in the chair. The lecturer was Miss Gladys Burlton, who chose as her subject "Personal Salesmanship in the Electrical Industry."

Miss Burlton is undoubtedly a clever exponent of the art of salesmanship, and she endeavoured to forestall criticism to some extent by admitting at the very commencement of her lecture that she knew nothing about the electrical industry. It quickly became apparent that this was the case, and the lecture was ostensibly from one who viewed the matter of personal salesmanship in the electrical industry as a customer. Even so, it quickly became equally apparent that Miss Burlton either had not been in any showrooms of important supply authorities or had made such a hurried endeavour during some days preceding her lecture to prepare herself with material that she utterly failed to present a true picture of the actual position. Even with this somewhat severe criticism, which we feel justified in making, there was also an apparent desire on the part of Miss Burlton to score points at the expense of the electrical industry and particularly those engaged on the sales side, by applying some of those deft touches which are so familiar to the practised public speaker who has no solid foundation for some of his or her statements. The lecturer seemed to imply that everything that could possibly be wrong with the sales side of the electricity supply industry was wrong. Nobody concerned with the sales side of the supply industry will suggest that there is not considerable room for improvement in all directions, but even the most modest of those whose daily task it is to endeavour to sell electrical apparatus and fittings could not sit down under the castigations of Miss Burlton and feel that they were just. Indeed, it may be that the lecturer was indulging in leg-pulling of a very vigorous kind. She hinted that she had been making a round of showrooms belonging to supply companies and municipalities, and when one speaker frankly doubted it and suggested she had been to Selfridge's or Harrod's, Miss Burlton blandly smiled, and in her reply did not deny the suggestion. On one occasion Miss Burlton, when making a charge of hopelessly inefficient methods against some showroom assistant, accidentally or otherwise, said she had gone in to buy "a gas fire" but quickly changed the phrase to "an electric fire" when the audience roared. We cannot believe that such methods are used even in a gas undertaking's showroom. In the same way she spoke to an incredulous audience when she suggested that it was in an electricity supply showroom that the assistant did not know the voltage of the district!

We have made this variation of our usual reports of the E.D.A. Conferences because of the peculiar nature of the lecture in many respects, and our doubt whether lectures should be given by people utterly unfamiliar with the electrical industry, unless they confine themselves to generalities and do not enter upon specific criticisms which, even if they be true of some small showroom, must be promptly and strongly refuted as applying to the supply industry as a whole. A strong light was thrown upon Miss Burlton's knowledge of the industry when, replying to someone who had mentioned the I.M.E.A., she said "the I.M.E.A., whatever that may mean."

There were, however, good points in the lecture which were of value to those who listened to it. So long as the speaker kept off the type of superficial comment to which reference has been made—which one speaker in the discussion said no man in the industry would dare to make and not be put against a wall and shot—the lecture was thoroughly interesting, although it must be confessed that the suggestions as to the need for personality, knowledge of the article being sold, confidence in the article being sold, and so on, have been made at many a previous conference and form the subject of the lessons provided by salesmanship schools. Nevertheless, nobody would deny that Miss Burlton has personality, and whilst she lectured on personal salesmanship as such she was intensely interesting.

As some examples of the criticisms made, we were told that those engaged in showrooms in the electricity supply industry bore the entrance of possible customers with fortitude, and that in some cases Miss Burlton's presence was not even acknowledged the whole time she was there. Whether she meant by this that she had gone out without being attended to she did not make clear. Reference was made to a showroom—presumably electrical, but not stated to be so—where Miss Burlton was met by a commissionaire who, when she said she wished to look at some fires, said: "Oh!" and left her for a long time. Again, there were general charges that assistants in electrical showrooms were inclined to adopt a sort of "Post Office" manner, and that the customer, or would-be customer, was not made at home, and was given a bad impression. The whole lecture bristled with this kind of comment, which few in the room did not think was greatly exaggerated. At times even Miss Burlton must have felt she was going a little too far, for she added now and again, that of course she was exaggerating, "but you know the sort of thing I mean," which really was not very helpful

The discussion showed that the audience did not fail to catch the significance of the really good salesmanship points that were made in the lecture, and in general they were agreed with. There was, however, a very definite resentment of the general charges made, as already indicated, but as both the charges and the resentment were all in good humour, the meeting was in happy vein throughout. Speaker after speaker disclaimed the possibility of Miss Burlton having been in their particular showrooms and receiving the treatment that had been outlined, and it was left to one of her own sex, Miss C. Haslett, of the Electrical Association for Women, to reply to Miss Burlton most severely. Miss Haslett thought that if Miss Burlton could spare the time to spend six months or more in an electrical showroom, she would be in a position to give the E.D.A. a much more useful lecture than she had done. There was, she said, a totally different atmosphere in an electrical show-

room from that in any other showroom, and that had to be understood to be appreciated. At the same time, Miss Haslett spoke of the fact that there was at the present time a great demand for trained saleswomen in the electrical industry, and that that demand could not be met because we had come to the end of the supply. She urged, therefore, the need for some definite scheme of training young girls for electrical showroom work, and expressed the belief that the industry had not yet realised that necessity, and was not treating the matter seriously.

Several speakers in the discussion agreed, as they were bound to, with the general points made in the lecture, and one even went so far as to accept as a fact that an assistant in a supply authority's showroom did not know the voltage of the district, and he instanced the possibility of that in his own showroom because the district had four different voltages.

Councillor Watt, of Woolwich, smilingly suggested that Miss Burlton was something of an actress, and complained of the foreign trash that was being sold in the large stores, and was doing harm to the industry.

Mr. Howell (Battersea), commenting on the many attributes of the successful salesman or saleswoman, as laid down by Miss Burlton, expressed the hope that the lecture would be repeated before the Electricity Commissioners and the I.M.E.A., because at the present time it seemed that salesmen and saleswomen having the many qualities outlined were expected for a salary similar to that now paid to a municipal dustman.

Mr Jackson complained that there were instances in the industry of enthusiastic young salespeople having their enthusiasm damped by the management, which was not as progressive at it should be.

Mr. Hayes also emphasised the need for training juniors, and complained of under-staffing in showrooms as well as inadequate payment. He urged salespeople to demand higher salaries, having regard to the technical knowledge that was required.

Many others took part in the discussion, and dealt with various points mentioned in the lecture, their remarks indicating a very live state of affairs in the sales departments and showrooms of the electricity supply industry.

Sir Andrew Duncan said he had visited a very large number of showrooms, and some of the more recently erected were very expensive and well laid out. The one question he always asked was: Where is the "complaints room"? He invariably got the reply, "We do not have complaints," but when he got that answer he always knew what to think. In another country he recently saw a most interesting illustration of how a sales department should be managed. The best room on the ground floor was set aside for receiving inquiries, and if anybody wanted to complain about anything he was attended to by the best salesman. On an upper floor there were from 24 to 48 telephonists attending to telephone calls from consumers; that was what he called real sales organisation. That, of course, was a very large undertaking, and there was room for it, and the same thing could not be applied to smaller undertakings. At the same time, it would be useful if the E.D.A. spent an evening having a general discussion on the general organisation of a sales department.

Miss Burlton, in the course of her reply, acknowledged that she would have been able to give a more useful lecture had she known more about the problems of the electrical showroom. She expressed the hope that if there were any representatives of management present they would take note of what had been said with regard to staffs and salaries; the golden rule for staff management was to select carefully, train carefully, pay well, and promote adequately. If those points were concentrated upon there must be a tremendous move forward in the industry.

A hearty vote of thanks was accorded Miss Burlton at the close of the discussion.

Many of those present remained after the meeting to hear a broadcast talk by Sir Oliver Lodge on "The Beginnings of Electric Light," which dealt with Sir Joseph Swan's invention of the incandescent electric lamp. The receiving apparatus was provided by the General Electric Co., Ltd.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Our Telephone Number.

We wish to remind all of our friends that our telephone number is and has been for some time past:—

Central 5871 (5 lines).

The Patents Committee.

The Committee, which was set up under the chairmanship of the Right Hon. Sir Charles Sargant to consider whether any amendments in the Patents and Designs Acts, or any changes in Patent Office practice, were desirable, is continuing its meetings at the Board of Trade for the purpose of hearing evidence from interested persons and associations. Four meetings of the Committee took place before the vacation, and during the next few weeks evidence will be taken from representatives of the Trade Marks, Patents and Designs Federation, Ltd., the British Science Guild, the London Chamber of Commerce, the International Association for the Protection of Industrial Property (British Group), the Association of British Chemical Manufacturers, and the Chartered Institute of Patent Agents. Any persons or associations who desire to submit any further suggestions, or to give evidence, are invited to communicate with the Secretary, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25, Southampton Buildings, W.C.2.

Wages in the American Electrical Industry.

Included in statistics of United States wages and hours in the October *Ministry of Labour Gazette* are figures relating to the electrical manufacturing industry. The average hourly earnings are given as follows:—Unskilled males, $0.491; skilled and semi-skilled males, $0.687; and females, $0.429. The average weekly earnings for these three classes are:—$22.67, $32.39 and $16.49. The average number of hours worked per week (all classes) was 45.9. The wages paid were above the average for all industries and the hours worked below the average (48.2).

German Cable Exports.

Most of the German cable manufacturing firms are united in the two Berlin syndicates—the Schwachstrom Kabelverband for l.p. cables, and the Vereinigung Deutscher Starkstrom Kabelfabriken for h.p. cables. The syndicates exercise a regulating influence on prices, which they prescribe to firms making offers. During the past few years the syndicates have considerably strengthened their position, and to-day have a dominating control over the market conditions. Now some ten member firms have formed a company with a share capital of 500,000 marks to watch over the common interests of the participants, especially abroad. Among other matters, it is stated that the new company proposes to attend to propaganda and organisation. The exports of cables of all kinds from Germany rose from 42,000 tons in 1927 to 49,000 tons last year, the values having been 40 million marks and 47 millions, respectively. During the first half of 1929 the exports are stated to have amounted to 33,500 tons, valued at 35 million marks.

Franco-Dutch Lamp Agreement.

The Amsterdam correspondent of the *Financial Times* says that it is reported that Philips Glowlampworks has entered into a co-operative agreement with the French Thomson-Houston Co., which has resisted recent attempts by the American General Electric Co. to acquire a large interest.

The American G.E. in Russia.

According to a Riga message last week, the President of the Soviet Electrical Trust states that the agreement with the American General Electric Co. has been settled. The American company is to send a body of engineers to work in the Trust's factories, and has granted rights in respect of a number of patents, in particular those concerned with railway electrification. At the same time, it is reported that a director of the German A.E.G. is in Russia negotiating for a somewhat similar agreement.

New B.I. Showroom.

A recent innovation at the Prescot works of British Insulated Cables, Ltd., is a large showroom containing examples of the very wide range of articles manufactured by the company. Joint boxes, cut-outs, paper pinions, house-wiring fittings, cables and flexibles, static condensers, electric welders, tramway and railway overhead fittings, and many other B.I. products are well displayed, while the room is hung with photographs of installation work. A lantern and kinema projector enable slides or films to be shown. The windows on one side of the room have been treated in a somewhat novel manner by filling them in with large, hand-coloured photographic enlargements of the Central Scotland overhead work and the Great Indian Peninsula Railway electrification contract. The showroom, which is illustrated herewith, has already proved very useful in affording visitors to the works a rapid and comprehensive survey of B.I. manufactures.

The B.I. Showroom, Prescot.

The Sydney Bribery Charges.

Reuter (Melbourne) reports that the full High Court has confirmed the conviction of Messrs. Babcock & Wilcox, Ltd., for bribery in connection with a contract for power plant for the Sydney Municipal Council, on an appeal by the Crown from a decision of the Appeal Court quashing the conviction. It will be recalled that S. Y. Maling, the municipal official concerned, was sentenced to six months' hard labour and fined £500. The company was later fined £1,000, and ordered to refund £10,600 to the Sydney City Council; it is this decision which has now been confirmed.

Recent Contracts.

Mention was made in our last issue (p. 681) of the placing of contracts for the equipment of the new underground railway in Buenos Aires with the Metropolitan-Cammel Carriage, Wagon & Finance Co., Ltd. It was there stated that the electrical part of the contract had been sub-let to the General Electric Co., Ltd. This covers the whole of the electrical equipment of the rolling stock, *viz.*, motors and control gear, for a total of 56 motor coaches. The latest type of G.E.C. (Oerlikon system) traction equipment will be fitted; the motors will be of the self-ventilated interpole type, arranged for field tapping, and the control will be of the unit-switch electro-pneumatic type. The equipment will have to deal with the heavy passenger traffic usual on urban and interurban railways, and the company's design is well calculated to withstand the most severe working conditions. The G.E.C. is also supplying the equipment for the lighting and the automatic door control of the coaches.

The English Electric Co., Ltd., has received an important contract from the South Indian Railway Company for the rolling stock required for the electrification of the Madras suburban services. The order comprises 17 three-coach articulated units, each unit consisting of three all-steel coaches, together with the necesary electrical equipment. In addition, there are four electric goods locomotives. The total value of the contract is about £170,000.

Messrs. Butters Bros & Co., McLellan Street, Glasgow, have secured the contract for the electric crane which will be used at Liverpool Cathedral. The crane will be one of the largest ever used in building construction; with jib elevated, it will be able to lift loads up to five tons to a height of almost 300 feet.

It is reported that Messrs. C. A. Parsons & Co., Ltd., have received an order from the Northern Provinces Electricity Co., Holland, for two 30,000-kW turbo-generators and condensing plant. The plant has to be ready for service by February, 1931.

New French Company.

A new French company has lately been formed in Paris (173, Route de la Revolte, Levallois-Perret), with a capital of 1,300,000 fr., and the title La Société d'Eclairage et de Technique Théatrale to specialise in theatre, kinema, and shop-window lighting installations.

Sturdy Electric Lamps.

Though incandescent electric lamps have glass bulbs, some of them seem to have iron constitutions. Among recent instances which have been brought to our notice of lamps which have withstood very rough treatment, the following are of interest. The first was an "Osram" lamp fitted in a street-lighting standard. An accident occurred which involved the standard and broke it off near the base. The top portion crashed to the pavement, but the lamp remained unperturbed and still shone brightly.

The other instance is provided by Metro-Vick Supplies. A friend of the company was walking along a deserted part of the sea-shore when he saw a lamp lying half buried in the sand. It proved to be a "Cosmos" lamp which, from its marking, had evidently been supplied to the Admiralty. It is presumed that it was thrown overboard from a warship, and had no doubt travelled some distance without damage apart from a slight loosening of the cap. It still functions quite well.

The E.D.A. November Programme.

The November programme of the British Electrical Development Association is devoted mainly to preparations for the Christmas season, as will be noted from the month's window display which we illustrate. This display introduces an up-to-date Santa Claus, who advocates the giving of electrical presents. Examples of appliances which are eminently suitable for this purpose are arranged in a simple group. The square columns upon which the appliances are mounted are from previous window displays, and the cost of the extra material is very small. The electrical Christmas gift idea will be the *motif* of large displayed advertisements in the principal London and provincial newspapers during the month, and other advertising schemes provide for the insertion of advertisements in many of the leading home journals, architects' newspapers, and the general Press. As usual, electros are available for the use of retailers in their local Press advertisements. The programme lists a number of E.D.A. publications appropriate to the season.

The E.D.A. November Window Display.

and illustrates two of the showcards, which can be obtained from Savoy Street. The Electric Homes (Outlet) Campaign is surveyed, its objects and means of attaining them being set out in clear terms.

Irish Free State Electrical Imports.

The Irish Free State Ministry of Industry and Commerce has issued detailed figures of imports during the six months ended with June last comparing them with the corresponding half of 1928. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and cognate material into the Free State, and the amount attributed to the United Kingdom as country of shipment, but not necessarily of manufacture:—

	Total imports. January to June,		U.K. share January to June,	
	1928	1929	1928	1929
	£	£	£	£
Electric wires & cables	91,131	102,781	25,183	49,046
Telegraph and telephone apparatus	5,779	14,621	4,845	13,501
Electric lamps & parts	21,244	36,595	15,916	21,600
Batteries & accumulators	11,539	12,854	10,533	10,558
Radio sets and parts ...	40,407	40,052	39,832	39,421
Other electrical goods and apparatus ...	43,573	104,814	29,514	82,257
Generators	4,978	60,183	4,703	8,168
Motors	11,985	19,635	5,786	15,975
Other electrical machinery	53,010	113,064	31,992	37,632
Totals	£283,646	£504,599	£168,304	£278,158

As will be seen, of the total imports £278,158, or approximately 55 per cent., came from ports of the United Kingdom, as against about 60 per cent. in the first half of 1928. The foreign imports, consisting largely of wires and cables, and electrical machinery, of which the bulk is credited to Germany.

An Inter-Imperial Electrical Contract.

Reuter's Sydney correspondent reports that an order has been received by the Clyde Engineering Co., Ltd., of Sydney, New South Wales, from South Africa for batteries costing over £100,000. The order is from a big commercial firm and was secured in the face of keen competition from English, German, and American battery manufacturers.

Employment during September.

The October *Ministry of Labour Gazette* states that employment in the engineering industry during September was still slack on the whole and showed a further slight decline in nearly all sections. In the electrical branch, however, conditions were still fairly good. The number of unemployed in the industry as a whole rose by 3,185 to 93,750, the proportion thus increasing from 9.3 to 9.6 per cent. The proportion of unemployed in the electrical engineering industry rose from 4.2 to 4.4 per cent., the actual number being 3,482. In the electrical wiring and contracting industry there was a slight improvement; the number of unemployed was reduced to 1,007, the proportion falling from 6.6 to 6.5 per cent. The electric cable, wire and lamp manufacturing group improved to a greater extent; the number of unemployed fell to 3,764 and the percentage from 4.9 to 4.4.

Finnish Electrical Imports.

According to a recent return, the value of the electrical machinery and apparatus imported into Finland during last year amounted to £1,250,050, as compared with £702,050 in 1927. No less than 43.5 per cent. of the imports are credited to Germany, 39.1 per cent. to Sweden, 6.4 per cent. to Holland, 2.2 per cent. to the United States, and 1.2 per cent. to Great Britain.

New Municipal Showrooms.

The new electricity offices and showrooms in Harmer Street, Gravesend, arranged by the Corporation Electricity Department, were opened on October 23rd by the Mayor, Councillor R. McGregor, J.P. Electric cooking demonstrations were given daily extending from October 24th to November 6th. Members of the electricity staff were present to give full information regarding domestic electricity supply and services, and there were on view a collection of the latest cookers, water heaters, fires, &c.

The G.E.C. and the Ideal Home Exhibition.

We have now received complete particulars of the competition which the organisers of the Ideal Home Exhibition and the General Electric Co., Ltd., have arranged. As we reported in a recent issue, a "Pavilion of Light" is to be erected at Olympia comprising a lounge, dining room, bedroom, nursery, kitchen, bathroom, garden lounge, two salons, and a service room. Prizes are offered to architects and collaborating artists for the arrangement of the first four rooms, while electrical contractors are invited to submit schemes for the equipment of the kitchen and bathroom. In addition, 20 prizes are offered to artists and art students for designs of electric lighting fittings for the home. Full details of the scheme can be obtained from the *Daily Mail* (Electrical Competition), Carmelite House, London, E.C.4.

Czecho-Slovak Import Restrictions Removed.

It is announced that the restrictions upon the importation of electric telegraph, bell and signalling apparatus and electric lamps into Czecho-Slovakia were removed on September 30th.

Bankruptcy Proceedings.

V. F. Maddox, 6, Homend Street, Ledbury, Hereford, electrical and wireless engineer.—The public examination of this debtor was held recently at the Shirehall, Hereford. The statement of affairs showed liabilities of £459, and assets estimated to produce £168, leaving a deficiency of £293. Debtor attributed his failure to giving too long credits, so that he could not pay wholesale merchants, and to his having had to pay costs of legal proceedings. Debtor stated that in 1921 he commenced to build up an electrical business. He had no capital and no premises, but used part of his father's shop. At first the business did not make enough to keep himself and his wife, but later he made a small profit. He had had loans from relatives amounting to £147. The examination was adjourned for completion.

W. J. Phillis, 87, Overton Road, Leicester, electrical engineer.—The receiving order herein was made on October 2nd on the debtor's own petition. According to the statement of affairs filed there are liabilities amounting to £311, as against assets of £31, leaving a deficiency of £280. Debtor attributed his failure to keen competition and lack of capital. From July, 1919, until the end of 1923, the debtor was employed as an electrician in America. He returned to England with about £220 savings, and for the next eighteen months was associated with two relatives in a small business. He later commenced business on his own account with a capital of £15. According to the debtor the electrical and wireless side of the business and the wiring of houses by contract was fairly successful until 1928, when competition became keener. Since March last his work has been limited to wiring houses for a builder. The debtor states that he became aware of his position in January last. The first meeting of creditors was held on October 18th, at the Official Receiver's office, Leicester. The case, being a summary one, was left in the hands of the Official Receiver. The following are creditors:—

	£		£
Edison Swan Electric Co., Ltd.	170	Wilson, Partridge & Co.	27
		Warner, J. W. P. ...	22

D. B. John (D. B. John & Bros.), electrical engineer, &c., 8, Commercial Place, Pontycymmer, and Nanthir Stores, Nanthir Road, Blaengarw.—First and final dividend of 9¼d. in the £, payable at the Official Receiver's Office, 34, Park Place, Cardiff.

F. H. Graham, electrician, 14, Hilltop Avenue, Harehills, Leeds.—First meeting held October 24th, at the Official Receiver's office, 24, Lower Bond Street, Leeds. Public examination, November 12th, at the County Court House, Leeds.

G. C. Lazenby, wireless engineer, 29, Old Town Street, Plymouth.—Trustee, Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C.1, released August 8th.

P. W. Witham, electrical engineer, 139, Bournemouth Road, Parkstone.—Trustee, Mr. F. G. Wheatley, 102, High Street, Poole, released August 12th.

K. P. J. Jolivard (K. Jolivard & Co.), electrical engineer, late of 66, Victoria Street, S.W.—Last day for proofs for dividend, November 2nd. Trustee, Mr. E. Parke, Official Receiver, Carey Street, W.C.

D. Brayshaw, electrician, 78, Granby Street, Liverpool.—Last day for proofs for dividend, October 30th. Trustee, Mr. J. Allcorn, Official Receiver, Government Buildings, Victoria Street, Liverpool.

H. A. Langlois (trading in co-partnership with D. T. Donovan as the London Electrical Co.), electrical engineer, 119, St. Mary Street, Cardiff.—Application for discharge to be heard December 3rd, at the Law Courts, Cardiff.

W. Ross, wireless engineer, 35, Bridge Street, Haverfordwest.—Trustee, Mr. H. W. Thomas, Official Receiver, 4, Queen Street, Carmarthen, released September 30th, 1929.

H. Milnes, (H. Milnes & Son) plumber and electrical engineer, 6, Trinity Street, Huddersfield.—Trustee, Mr. A. Pontefract, 6, New Street, Huddersfield, released August 2nd, 1929.

C. S. Hill (Sanderson Hill & Co.), electrical factor, Waltham Chambers, Waltham Street, Kingston-upon-Hull.—Trustee, Mr. W. B. Hall, National Provincial Chambers, Silver Street, Hull, released October 5th.

J. Cameroff, electrical engineer, 147, Spencer Place, Leeds.—Receiving order made October 11th, on debtor's own petition.

T. C. Cottrell, electrician, 31, Autumn Street, Burley Lodge Road, Leeds.—Receiving order made October 12th, on debtor's own petition.

C. W. Sands, electrical and wireless contractor, High Street, Kings Langley.—Receiving order October 9th on debtor's own petition. First meeting held October 22nd, at 29, Russell Square, W.C.; public examination November 27th at the Court House, St. Albans.

J. Turner, wireless dealer, 103a, Little Ilford Lane, Manor Park, E.12.—Receiving order made October 14th on debtor's own petition. First meeting to-day (Friday); public examination, November 19th, both at Carey Street, W.C.

P. G. Crump (Dales), wireless dealer, &c., 44, Wyle-cop, Shrewsbury.—Trustee, Mr. C. J. Pyke, Official Receiver, 22, Swan Hill, Shrewsbury, released October 4th.

H. W. Beesley, motor, cycle and wireless engineer.—First and final dividend of 6s. 1¾d. in the £, payable October 25th at the Official Receiver's office, 37, Cornmarket Street, Oxford.

J. Littler, electrical and radio engineer, 9, Hoghton Street, Southport.—First dividend of 2s. 6d. in the £, payable October 25th at the office of the trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester. (This amended notice is substituted for that appearing in the *London Gazette* of October 11th, 1929.)

Company Liquidations.

Mawlite Electric Lamp Co., Ltd., 28, Belgrave Road, S.W.—A meeting of creditors was held on October 14th at the offices of the company, when the liquidator, Mr. S. E. Eastbury, presented a statement of affairs as at September 24th last, which disclosed liabilities to unsecured creditors of £1,146. There were preferential claims of £60 and a bank overdraft of £30. The amount due to the trade was £486, whilst there were cash creditors for £659. The only assets of the company were book debts estimated to realise £28 and a small amount of petty cash. The liquidator said that one of the directors of the company, a Major Mawson, had distrained in respect of rent and the stock and fixtures had been realised to satisfy that debt. The company had been in existence for about three years, the nominal capital being £200. Losses had been incurred from the commencement, which the liquidator said was mainly attributable to the heavy overhead expenses. A creditor said that the meeting was not valid as the Companies (Consolidation) Act had not been complied with. The creditors agreed and the liquidator intimated that he would call another meeting.

Stevens & Cole, Ltd., 46, Barking Road, Canning Town, Essex.—Under the compulsory liquidation of this company, which dealt in wireless equipment, gramophone records and accessories, accounts have been lodged showing liabilities of £2,497, against assets of £904, and a total deficiency of £1,743 with regard to contributories, the issued capital being £150. Mr. H. P. Naunton, Official Receiver, reports that the company was registered in June, 1928, with a nominal capital of £500 and took over three businesses in East India Dock Road and Barking Road, where Leonard Cole had traded as Stevens and Cole. The businesses of the company did not flourish, and on April 15th last a debenture for £150 was issued to Cole to secure a loan of that amount. A receiver was appointed on June 25th and he took possession of the assets. The failure is attributed to severe trade competition, depreciation of stock, and lack of experience by the directors. The liquidation is in the hands of the Official Receiver.

Electric Production Co., Ltd.—A meeting of members is called for November 14th, at the offices of Leonard, Dickinson and Co., 82, Victoria Street, S.W., to hear an account of the winding up from the liquidator, Mr. G. Dickinson.

American Radio Combine.

The formal announcement of the organisation of the General Motors Radio Corporation was issued by the executives of the General Motors Corporation and the Radio Corporation of America last week. The new concern will manufacture radio sets and develop sets for installation on motor cars made by General Motors. The agreement is between General Motors on the one hand, and the Radio Corporation and the American General Electric and Westinghouse Companies on the other. General Motors contributes $5,100,000 in cash, and the other group $4,900,000 and grants licences for all its patents covering radio, &c. The new corporation will be capitalised at $10,000,000 in preferred, and 1,000,000 no-par-value common shares, of which General Motors will own 51 per cent. and the radio group 49 per cent.—*Reuter* (New York).

Westinghouse Metal Rectifiers.

The Westinghouse Brake & Saxby Signal Co., Ltd., states that advices have been received that the United States Court has declared that the "Kuprox" rectifier is an infringement of the Grondahl patent, under which Westinghouse metal rectifiers are manufactured, and the Court has declared the patent valid. The company is the owner of the British rights in the patent.

Advertisement Correction.

We regret that a printer's error occurred in the advertisement of Messrs. Edwardes Bros. in our issues of October 11th and 18th (pp. 32 and 26 of the Advertisement Supplement, respectively). The size of cable in line 8 should have been 7/.044 and not 7/.064 as printed.

Important American-German Telephone Agreement.

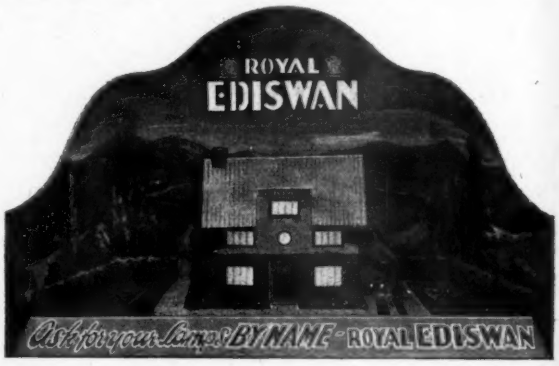
The International Telephone and Telegraph Corporation announces that it has come to an agreement with the Allgemeine Elektricitäts Gesellschaft and the firm of Felten and Guilleaume for the establishment of a new German company which will acquire interests in German telephone manufacturing companies and assist in the development of their business. The new company will acquire immediately Mix & Genest, Ferdinand Schuchhardt A.G., and the Sud-deutsche Apparatfabrik G.m.b.H. The American company will place all its patent rights at the disposal of the new concern.—*Reuter* (New York).

In a pronouncement upon the subject last week, Herr C. F. von Siemens, head of the Siemens concerns, deprecated the penetration of foreign capital into German industry. He said that many leaders of the electro-technical industry had called in foreign aid because they thought that they could not weather the storm without it. While it might be necessary to obtain the support of foreign capital, it would be a mistake to allow it to seize control of German industry. He was confident that the latter would emerge successfully if it kept free of this control.

The 1929-30 Lighting Season.

Among the selling aids produced by the electric lamp manufacturers, one of the most attractive is the large showcard produced by the British Thomson-Houston Co., Ltd., which bears a reproduction of the familiar picture of the "Mazda" dancing girl with the title "Beauty Enriched by Light." Another device which is being supplied by the same company is a cardboard "cabinet" for the display of the simplified line of "Pearl" lamps; this has a pocket in the front for pamphlets. On another showcard particulars of "Mazda" lamps for various makes of motor vehicles are given.

The Edison Swan Electric Co., Ltd., has designed a cut-out window display for the use of retailers of "Royal Ediswan" lamps.



A "Royal Ediswan" Window Display.

This takes the form of a house set in scenery of charming colours. The windows of the house are lighted as are the headlights of the car which is seen emerging from the garage in the accompanying illustration. The words "Royal Ediswan" are illuminated and continually change colour; no flashers are employed. The display is about 38 in. wide and 24 in. high.

British Cables for Dundee.

At last week's meeting of the Dundee Electricity Committee a tender for British cable at £5,796 was accepted. It was stated by the Convener that the difference between the British and foreign quotations was only about 8 per cent. When tenders were last considered there was a margin of 17 per cent.

Unemployment.

A further increase of 25,338 in the total number of registered unemployed was recorded for the week ended October 7th. At that date the total was 1,207,200, as compared with 1,181,862 on Sptember 30th, and 1,319,706 on October 8th, 1928.

Trade Announcements.

Mr. F. J. Serle, 10, East Reach, Taunton, Somerset, has opened new showrooms at 57, East Street, Taunton, where he is showing radio sets, components and "Fuller" batteries.

Mr. W. Moody has relinquished his position as manager of Messrs. C. Gilbert & Son, electrical and radio engineers, Marylebone.

In our last issue, in recording their change of address, we described Messrs. Harry Jones & Co. as electro-platers. While they do electro-plating, their primary business is the manufacture of electric lighting fittings.

New Distributors of Edison Storage Batteries, Ltd., have removed to permanent offices on the sixth floor from the temporary offices on the fourth floor, at their same address, Victoria House, Southampton Row, W.C.1. The telephone number is unchanged.

Accumulators of Woking (1928), Ltd., states that several exaggerated reports have appeared regarding the extent of damage caused by fire at its works on October 19th. Although a considerable amount of batteries for home and foreign railways were destroyed, the fire was entirely confined to one section of the assembly shop, and no part of the production side of the work has been affected. Arrangements have been made for assembling to go forward through other shops, and deliveries will be maintained with the minimum delay.

Continental Electrical Development.

In the course of the annual report of the Bank für Elektrische Unternehmungen, Zurich, which is the well-known Swiss investment company and promoter of electrical undertakings, the directors state that the steady development in the electricity supply industry continues undiminished without regard to political and economic fluctua-

tions. In all countries the demand for electricity is steadily growing, and scarcely has a new works been put into operation than a number of new and still larger schemes are projected. The confidence of engineers and economists in the great possibilities also seems to be shared by the investing public, since of all securities electricity shares, &c., are the least affected by Stock Exchange reactions and continue to enjoy great popularity. It is to be desired, the report says, that this fully-justified tone for electrical undertakings should not be disturbed by exaggerations. At the recent annual meeting of the Bank it was stated, on behalf of the directors, that the financial situation of the Bank continues to be liquid, and that considerable funds are available for new transactions. The centre of gravity of the Bank's activity in 1928-29 was in Spain and France, while interesting possibilities have arisen in Italy.

A " Specials " Tug-of-War Cup.

The Magnet House Head Office special constables recently won the tug-of-war challenge cup for Special Constabulary teams of London business houses. The G.E.C. team defeated Gamage's in the first round and Shoolbred's in the final.

For Sale.

Blackburn Corporation Electricity Department has for disposal a number of second-hand d.c. amp.-hour meters by Ferranti and Chamberlain & Hookham. The West Central Merchandise Mart will sell by auction at York House, Southampton Row, W.C., on October 30th, lighting cables, electrical fittings, radio goods, rubber-covered wire, &c. (See our advertisement pages to-day.)

New Zealand's Electrical Imports.

The *Board of Trade Journal* shows that the imports of electrical equipment into New Zealand during the second quarter of this year was £513,632. Of this the United Kingdom accounted for £281,682, the United States for £111,399, Canada for £47,682, and Australia for £12,902.

German Electrical Exports to Russia.

Statistics published by the *Board of Trade Journal* show that during 1928 electro-technical products valued at 26,927,000 marks (about £1,346,000) were exported from Germany to Soviet Russia, as compared with 16,008,000 marks (£800,000) in 1927. The exports of electrical machines (including parts) had a value of 21,469,000 marks (£1,073,000) against 14,804,000 marks (£740,000) in 1927.

The Motor Show " Exide " Luncheon.

The annual luncheon given by the Chloride Electrical Storage Co., Ltd., on the occasion of the opening of the Motor Show took place at the Clarendon Restaurant on October 17th. Mr. D. P. Dunne, a director of the company, gave some hints on the care of batteries to be used or laid by, as the case may be, during the winter months. He animadverted on the slogan " Buy British," which would not help the sale of British cars in foreign countries and he doubted its effect in the Colonies so long as the British car was built " to a Home Government specification." In selling Exide batteries his company used the slogan " Buy Exide—it's the best." And he ventured to suggest for the car industry " Buy the best—it's British." Exide batteries were sold in important quantities in most European countries as well as in all other countries. Sales were initiated, not by advertising, but by invasion. Mr. Dunne welcomed the development of the British car abroad and said when and wherever it arrived it would find Exide already established and at its service.

New Catalogues and Lists.

Walsall Electrical Co., Ltd., 61, Bridge Street, Walsall.—An illustrated and priced leaflet of oil-immersed star-delta starters.

Messrs. Belling & Co., Bridge Works, Southbury Road, Enfield.—A very complete catalogue (pp. 72) of electric fires, cookers, water heaters and other domestic appliances. The list of the company's products is prefaced by some useful notes on the use and advantages of electrical appliances in the home.

Messrs. Henry Wallwork & Co., Ltd., Red Bank, Manchester.—Leaflet No. 569 drawing attention to the company's totally enclosed gearing and No. 102, describing variable-speed gear.

Vacuum Oil Co., Ltd., Caxton House, Westminster, S.W.1.—An illustrated brochure dealing in an interesting manner with the horizontal steam turbine for stationary plants.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18.—Publications describing the company's wireless and marine service, auto alarm device, auxiliary apparatus for ships, wireless direction finder, and short-wave transmitter (auxiliary) and receiver.

Cook Electric Co., 2,700 Southport Avenue, Chicago, U.S.A.—An illustrated leaflet outlining the advantages of the type X telephone terminal.

Messrs. Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, S.W.1.—An attractive showcard of the company's closed top type of cell. The card is a very faithful reproduction of the actual cell.

D.P. Battery Co., Ltd., Bakewell, Derbyshire.—Two illustrated pamphlets advertising the " Kathanode " battery for omnibus lighting and in connection with totalisators.

Messrs. H. E. Ashdown (B'ham), Ltd., Aldridge Road, Perry Barr, Birmingham.—A leaflet illustrating the company's lampholders; also two folders drawing attention to Bakelite mouldings and lampholders.

Ever-Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.—A trade list of portable electric flash lamps, refills and wireless batteries showing retail prices.

British Insulated Cables, Ltd., Prescot, Lancs.—Publications Nos. H. 118, P. 250, and P.F. 59, drawing attention, respectively, to multiple telephone cables for indoor use, " Prescot " a.c. meters, and B.I. aerial cable unions.

Philips Lamps, Ltd., Philips House, 145, Charing Cross Road, W.C.2.—Publication No. 214 L, giving particulars of daylight blue headlight lamps and " Duplo " anti-dazzle lamps.

Messrs. J. M. Doughty & Sons, Ltd., 214 to 222, St. John Street, Clerkenwell, E.C.1.—Two well-produced catalogues of the company's lighting fittings. Fully illustrated and priced.

Messrs. H. J. Baldwin & Co., Commercial Union Buildings, Cheapside, Nottingham.—A comprehensive loose leaf catalogue divided into three sections, *viz.*, cable covers, ducts, and troughing. A thumb index is provided for each section, and the catalogue is fully illustrated.

Carron Company, Carron, Falkirk.—A showcard illustrating a lady using a Carron electric iron, who is obviously finding the task of ironing a pleasurable one. Also a copy of the company's new season fire catalogue, containing illustrations, dimensions, and prices of electric fires.

Messrs. Varley (Oliver Pell Control, Ltd.), Kingsway House, W.C.—A catalogue of radio receivers, gramophones, pick-ups, and auto-arms. The catalogue is divided into five sections, and in addition to an alphabetical index, includes a thumb index. Illustrated and priced. Also an instructional book, explaining the construction and operation of radio receivers, gramophones, &c.

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—A heating and cooking catalogue containing illustrations and prices of the company's domestic appliances.

Messrs. Fredk. Thomas & Co., Ltd., 189 and 191, Drummond Street, Hampstead Road, N.W.1.—A catalogue (pp. 89) illustrating the company's wide range of lighting fixtures. Also two booklets dealing with " Efteelite " lighting unit fittings and modern electrical fittings. Illustrated and priced.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—Several publications illustrating the company's radio components. Priced.

Ceag, Ltd., Barnsley, Yorks.—A brochure describing " Ceag " cap lamps for use in mines, and bulbs for miners' lamps.

Messrs. J. G. Statter & Co., Queen Anne's Chambers, Westminster, S.W.1.—Two leaflets dealing with air circuit breakers, including maintenance instructions.

" Typerlite " Company, 86, Cannon Street, E.C.4.—An illustrated price list of " Typerlite " fittings.

Henderson Wireless & Electrical Service, 54, Queen's Road, Brighton.—A net trade price list of electrical wiring supplies.

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—Three illustrated and priced leaflets dealing with Tungar battery chargers.

Wandsworth Electrical Manufacturing Co., Ltd., Kenyon Street, Birmingham.—An illustrated pocket price list of the company's electrical accessories.

Lunken Co., Ltd., 35, Great Dover Street, S.E.1.—A pamphlet drawing attention to the " Piccolo " hand tachometer.

Petters, Ltd., Westland Works, Yeovil.—A well-produced catalogue describing the company's atomic Diesel stationary type oil engines. Some excellent illustrations are included.

Mr. S. O. Bowker, 37, Tenby Street, Birmingham.—An illustrated booklet dealing with the " Tenby " wiring system.

Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton.—A leaflet advertising the " Superspeed " boiling plate.

Superlamp, Ltd., 92 and 94, Paul Street, E.C.2.—An illustrated list (pp. 65) of electrical material, motors, telephones and domestic appliances. Priced.

Messrs. Henry Jenkins & Sons, Ltd., Unity Works, Vittoria Street, Birmingham.—A list of electric lighting fittings. Illustrated and priced.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Publication No. 7250/4, fully illustrated, dealing with high-voltage apparatus, covering 33,000, 66,000, and 132,000-V installations in various parts of the world. Also the descriptive leaflets Nos. 40/1-1 and 40/2-1, dealing, respectively, with large induction motors and high speed induction motors.

Messrs. Lane & Girvan, Ltd., Caledonia Stove and Electrical Works, Bonnybridge, nr. Glasgow.—A catalogue giving illustrated particulars of " Caledonia " cookers, boiling plates, heaters, fires, &c. Priced.

Messrs. J. J. Eastick & Sons, 118, Bunhill Row, E.C.—The October number of " Eelex Radio Bulletin," contains matter relating chiefly to exhibits shown at the recent National Radio Exhibition. It also includes a news section of activities in the radio industry and a list of radio sets and components, with prices and illustrations.

The Timber Market.

Our Timber Trade Correspondent reports that the softwood section still shows great activity, both as regards imports from Russia, Finland and Sweden, and also demand, the latter

having been good since last February. There has been an increase lately in fresh mahogany log and other shipments to the United Kingdom, but supplies this year are still on the light side, with values firm. More foreign sawn hardwoods, especially from the United States, arrived in September, but imports have been low this year; stocks are large, with prices fairly firm. Good English oak, ash and other hardwoods, as well as Empire varieties, are to be preferred to many of the foreign woods.

Book Notices.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVII, No. 394, October, 1929. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"The Henley Telegraph" for September not only contains more matter than usual, its price has been reduced from 6d. to 2d. It is as ever interesting, amusing and instructive almost as much to others as to members of Henley's staff.

"Faraday House Journal," Vol. XIII, No. 4. London: Faraday House College.—Once again the Michaelmas term number of this house organ contains a large number of articles on many subjects.

Private Arrangements.

E. M. Parsons, electrician and wireless dealer, 57, Paragon Street, and 58, Prince's Avenue, Hull.—A meeting of creditors was held on October 11th at the offices of Messrs. Dawson and Lancaster, Hull, when a statement of affairs was submitted which showed liabilities of £4,562, and net assets of £1,101, leaving a deficiency of £3,461. It was reported that the unsecured creditors' claims included cash creditors for £2,695, who had agreed to withdraw their claims in the event of the estate being wound up under a deed of assignment. The creditors resolved that subject to the cash creditors withdrawing their claims, the deed of assignment executed by the debtor in favour of Mr. J. J. Campbell as trustee should be confirmed. The following are creditors:—

	£		£
Ashcroft, E.	200	General Electric Co., Ltd.	75
Chloride Electrical Storage Co., Ltd. ...	64	Houghton - Butcher, Ltd.	75
D.P. Battery Co., Ltd.	76	Hacquoil & Co. ...	636
Etherington, H., and Sons	142	Kettlewell, Son & Co., Ltd.	93
Edison Swan Electric Co., Ltd.	59	Liverpool Electric Cable Co., Ltd. ...	56
Electric Lamp Factors, Ltd.	70	Ninnes Holmestower...	656
Fifoot, F.	1,202	Taylor, J., & Son ...	64
Gilbert & Co.	106		

Kingston Electrical Exhibition.

As a means of further increasing the domestic load, the Kingston-on-Thames Corporation Electricity Department recently held an electrical exhibition at the Baths Hall. Despite the limited space available, an attractive display was arranged, and every appliance that was likely to be of interest to the housewife and of use in the home was to be seen. The previous exhibition was held some five years ago, so that visitors were confronted with apparatus showing a considerable advance in design and decorative effect. In opening the exhibition, the Mayor said that the demand for electricity was increasing, but they were handicapped, as they had no showroom with which to attract the domestic consumer. He ventured to prophesy, however, that they would possess one in the not distant future. The companies represented at the show included the following: Jackson Electric Stove Co., Ltd.; Berry's Electric (1928), Ltd.; Stearn Electric Co., Ltd.; Thames Electric Co., Ltd.; Metro-Vick Supplies; Drake & Gorham Wholesale, Ltd.; Bentalls, Ltd.; General Electric Co., Ltd.; Manor Electric Oven & Fire Co.; Frigidaire, Ltd.; W. H. Gaze & Sons, Ltd.; Singer Sewing Machine Co., Ltd.; C. Lathe & Co., Ltd.; and Thornton and Stimpson.

Prices of Materials.

Messrs. F. Smith & Co. report, October 22nd: Copper (electrolytic) bars, no change; ditto ditto sheets, no change; ditto ditto wire rods, £90, 10s. dec.; ditto ditto h.c. wire, no change; silicium bronze wire, 1s. 2d., ½d. dec.

Messrs. James & Shakespeare report, October 22nd: No change in the price of copper bars (best selected), sheet and rod; English pig lead, £24 10s., 5s. dec.

Messrs. Edward Till & Co. report, October 22nd: India-rubber, Para fine, 9¼d., ¼d. dec.

In their letter dated October 19th, Messrs. James Forster and Co. reported that the lead market was quiet again last week, and prices, following the tendency in other metals, became easier. Arrivals this month have not been too plentiful, with the result that "spot" lead is scarce and commands a premium, but with ample supplies expected in November, this shortage should be only temporary, particularly as consumption is already showing a tendency to decrease. Under present conditions higher prices than the present are not justified; in fact, had it not been for the control exercised by the Producers' Association during the past few weeks, lower prices would undoubtedly have been seen. The Board of Trade returns for September show imports of 25,127 tons and exports of 2,355 tons, leaving 22,772 tons for home consumption.

Lighting and Power Notes.

Ayrshire.—Year's Working.—The report of Mr. W. C. Bexon, engineer and general manager of the Ayrshire Electricity Board, for the year ended May 15th last shows a total revenue of £234,678, as compared with £231,015 in the preceding year. The working expenditure totalled £106,733, as against £94,058, leaving a gross profit of £127,945 (£136,957). A balance of £3,078 from the previous year added to the gross profit made a total of £131,023 available, and after providing for capital and other charges there was a net surplus of £3,289. The capital expenditure during the year amounted to £154,572, and included £47,977 for boiler plant, £42,999 for underground mains, and £29,871 for overhead transmission lines. The total now spent on the undertaking stands at £1,767,247. The sales of electricity increased from 37,312,534 to 38,569,499 kWh, and the maximum supply demanded from 18,700 to 20,400 kW. The average price obtained per kWh fell from 1.480d. to 1.460d. Extensions were made to accommodate two 50,000-lb. boilers, but these were not ready to be put into commission during the year. The total length of underground cable laid during the year, exclusive of services, was 20 miles, while 24½ miles of transmission line were erected.

Barnsley.—Mains Extensions.—The Corporation Electricity Committee is to extend mains to housing estates at a cost of £6,330.

Bicester.—Inauguration of Supply.—The ceremony of switching-on the town's electricity supply was performed recently by Mrs. Ruck-Keene, wife of Admiral Ruck-Keene, at the Wessex Electricity Co.'s sub-station in the Market Square. The cost of the electricity scheme so far has amounted to £20,000.

Bradford.—Year's Working.—We have received from Mr. Thomas Roles, city electrical engineer, a copy of the abstract of accounts of the Electricity Department together with the report of the Electricity Committee for the financial year ended March 31st last. The total revenue amounted to £574,159, as compared with £556,338 in the preceding year, and the working expenditure was £336,850, as against £317,184, leaving a gross profit of £237,309 (£239,154). Capital and other charges amounted to £223,553, and there was a net surplus of £13,756, as compared with £31,229 in 1927-28. A contribution of £21,000 was made to the district rate and £6,656 was devoted to other purposes. The balance was met by the appropriation of £13,900 from the depreciation, &c., account. The capital expenditure during the year totalled £204,399, the chief item being £186,637 for mains and services. The sales of electricity increased from 86,758,306 to 91,086,929 kWh. The maximum supply demanded fell from 41,700 to 41,000 kW, and the average price obtained per kWh from 1.447d. to 1.423d. Steady progress was made throughout the year on the erection of the buildings and plant in connection with the scheme for the installation of e.h.p. steam raising and generating plant.

Bristol.—Year's Working.—We have received from Mr. H. Faraday Proctor, chief engineer and general manager, a copy of the annual report, together with a statement of accounts, of the Corporation Electricity Department for the twelve months ended March 31st last. The total revenue amounted to £572,439, as compared with £536,910 in 1927-28, while the working expenditure was £279,529, as against £261,166. The gross profit totalled £292,910 (£275,744), to which was added income from other sources, making a total of £307,561 available. After providing for interest on loans, income tax, &c., there was a net surplus of £65,874, as compared with £117,991 in the preceding year. The capital expenditure during the year amounted to £731,264, and included £122,186 for buildings and £143,350 for culverts at the Portishead works and £132,614 for mains. The electrical energy sold increased from 84,123,978 to 93,441,031 kWh and the maximum supply demanded from 38,363 to 40,220 kVA. The average price obtained per kWh fell from 1.45d. to 1.37d. The first instalment of the Portishead works is almost completed and will be available for use shortly. The second instalment has been put in hand, the works comprising one 50,000-kW turbo-alternator, two boilers, and auxiliary plant.

Burton-on-Trent.—Electricity Supply Developments.—The Town Council has decided to spend £85,000 on electricity supply developments, chiefly for the purpose of extending the system to Uttoxeter, *via* Tutbury and Marchington.

Buxton.—New Electricity Charge.—The Corporation has adopted the following two-part "all-in" tariff, in addition to its flat rate system of charge: (*a*) A fixed charge based on the ratable value as follows:—Premises assessed at £60 and under, 20 per cent. on the net ratable value, with a minimum of £4; premises assessed at over £60, 20 per cent. of the net ratable value on the first £60 and 15 per cent. over that amount. (*b*) A "unit" charge of ¾d. for all energy consumed for all purposes.

Canada.—Hydro-Electric Development.—The Hydro-Electric Power Commission of Ontario has purchased the power rights of the Ottawa River at Chatta Falls for $750,000 (£150,000). The potential capacity of the falls is 250,000 h.p., involving an aggregate development expenditure of $7,500,000, the Provinces of Quebec and Ontario acting in co-operation.—*Reuter* (Toronto).

Croydon.—Year's Working.—The report of Mr. Alex. C. Cramb, borough electrical engineer, on the working of the electricity undertaking for the year ended March 31st last, shows a total revenue of £299,693, as compared with £277,703 in the preceding year. Working expenses increased from £106,073 to £108,559, and other expenditure charged to revenue from £42,992 to £45,553, leaving a gross profit of £145,581 (£128,638). Capital and other charges absorbed £91,177, and there was a net surplus of £54,403, as compared with £48,989 in 1927-28. The capital expenditure during the year amounted to £69,329 and included £39,518 for mains and £18,275 for machinery and plant. The sales of electricity increased from 31,914,634 to 39,368,221 kWh, and the maximum supply demanded from 16,200 to 19,000 kW. The average price obtained per kWh fell from 2.078d. to 1.815d.

Glasgow.—New Plant.—The Corporation Electricity Committee has decided to install automatic control gear at the Byres Road and Kelvinside sub-stations, at a total estimated cost of £1,600, and additional switchgear at various premises, at a cost of £1,145.

The Committee has authorised the manager to arrange for the installation of automatic control gear at the Byres Road and Kelvinside sub-stations at a total estimated cost of £1,600.

Mains Extensions.—The Committee recommends that distributing mains be laid at a cost of £3,000.

Progress During September.—Under the Corporation Electricity Department's scheme 668 houses were wired in September making the total to date 16,701, while 186 hired appliances were installed bringing the total to 18,610.

School Heating.—The experimental heating of schools by electricity is to be continued in Glasgow for a further period of one year.

The Clyde Valley Co.—The Clyde Valley Electrical Power Company is extending its cables in order to give a supply of electricity to Lenzie district. The work will be completed early next spring.

Guildford.—Electricity Supply.—The Corporation Electricity Committee is to provide a supply of electricity to Gooserye, Albury Heath, Farley Green and Little London at a cost of £5,782.

Mains Extensions.—The Committee has decided to extend mains in West Clandon and Burpham at a cost of £3,336.

Hereford.—Transfer of Undertaking.—The Corporation has applied to the Electricity Commissioners for consent to transfer its undertaking to the Shropshire, Worcestershire and Staffordshire Electric Power Co.

Liverpool.—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Corporation to supply electricity in the rural district of Sefton and parts of the rural district of Whiston.

London.—Islington.—The London and Home Counties Joint Electricity Authority has informed the Borough Council Joint Electricity and Lighting and Finance Committees that it is unable to agree to giving a supplemental supply of electricity, and has put forward an alternative offer to supply the whole of the Council's requirements. The committee recommends the Council to approve the scheme generally.

St. Pancras.—The Borough Council Electricity and Public Lighting Committee has recommended that the Central Electricity Board be informed that the Council is prepared to give a temporary supply of electricity upon the following terms:—(*a*) The Board to pay 25s. per annum per kW taken at the time of the maximum demand upon the Council's generation station with a minimum of £8,000 during the first year of supply. (*b*) The Board to pay in addition a running charge of 0.196d. per kWh, this charge to be variable in proportion to any variation in the cost of coal from 20s. per ton delivered. (*c*) The agreement to be for a period of one year from the date when the supply is first taken from the Board, with provision for its continuance from year to year until the generating station is operated under the South-East England Electricity Scheme, and subject to a satisfactory adjustment of the minimum kW charge of £8,000. (*d*) The power factor of the supply taken shall be maintained at not less than 85 per cent. lagging.

The Committee has also recommended the extension of mains, at an estimated cost of £1,264, and the conversion of 80 gas lamps to electricity, at an estimated cost of £356.

Loughborough.—Electricity Supply Scheme.—The Town Council has approved a scheme for the supply of electricity to the parishes of Hathern and Thorpe Acre and Lishley Grange. The cost of the cables and transformers is estimated at £5,700.

Louth.—Electricity Scheme.—The Town Council has received sanction to a loan of £22,043 for carrying out an electricity scheme under which energy will be received in bulk from Grimsby.

Manchester.—Progress during July and August.—During the months of July and August the Corporation electricity undertaking recorded an increase in connections of 3,669 kW, bringing the total up to 393,945 kW. The number of applications received for supply, including those for additional supplies, amounted to 2,098 and represented a total of 4,490 kW. The number of hired cookers connected increased by 122, making the total number of cookers actually connected 5,524. Applications for the hire of cookers totalled 178. Three new sub-stations were put into commission and additional plant was installed in five existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 8,260 consumers up to September 13th, and sanction had been given and work was in progress involving 916 consumers.

New Zealand.—Christchurch.—The report of the Municipal Electricity Department (manager: Mr. E. Hitchcock) for the year ended March 31st last shows a total revenue of £211,495, as compared with £194,037 in the preceding year. From this sum the following charges had to met: Working expenses, £50,581; purchase of bulk supply of electricity, £70,344; interest, £26,638; depreciation, £30,351. There remained a net surplus of £33,580, as against £22,517 in 1927-28. The revenue from sales of appliances, installations, &c., amounted to £55,243, and the expenditure was £51,302, leaving a profit of £3,941. The electrical energy purchased from the Lake Coleridge power undertaking totalled 45,787,949 kWh, as compared with 39,757,621 kWh, while the number of kWh sold increased from 34,894,754 to 40,470,596. An additional unit is to be installed at the Lake Coleridge power station, which will raise its capacity from 27,000 to 34,500 kW. The supply from the Waikaki development will, it is hoped, be available for the winter load of 1932.

Wellington.—We have received from Mr. M. Cable, general manager of the Corporation Electricity Department, a copy of the annual report and statement of accounts of the undertaking for the year ended March 31st last. The total revenue amounted to £325,823, as compared with £339,980, while the total working expenses were £137,463, as against £144,352. The profit was £188,360 (£195,628), and to it was added £521 bank interest, making a total of £188,881 available. Of this, interest on loans absorbed £29,722, sinking fund £7,429, renewal fund £18,460, and reserve fund £18,460. There remained a net surplus of £114,810, as compared with £124,038 in the preceding year. The capital expenditure during the year amounted to £48,266, the chief item being £29,971 for l.p. mains. The electrical energy sold for all purposes increased from 30,212,973 to 33,223,536 kWh, and the maximum supply demanded from 12,910 to 13,682 kW. The average revenue per kWh rose from 2.09d. to 2.33d.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Taunton.—Power: Up to 4,000 kWh per quarter, from 1½d. to 1¼d. per kWh; above 4,000 kWh per quarter, from 1¼d. to 1d.; above 32,000 kWh per annum, from 1d. to ¾d. per kWh. It is stated by the borough electrical engineer that the Corporation electricity undertaking's figure of 2.39 lb. of coal per kWh generated is believed to be the lowest in Great Britain when compared with entirely steam-driven stations with an output of only 3,518,106 kWh.

West Wiltshire.—*West Wilts Electric Light and Power Co., Ltd.*—Maximum demand rate for hotels, clubs, institutions, &c., from 2½d. to 2d. per kWh. Residential subscription rate: 2½d. for a certain number of kWh per quarter and 2d. beyond, reduced to 2d. per kWh. The company is introducing a reduced shop-lighting contract rate.

Rotherham.—New Electricity Charge.—At a recent meeting of the Corporation Electricity Committee the engineer reported on the advisability of adopting an alternative two-rate tariff. The committee decided to recommend that for h.p. electricity supplied in bulk and used for any required purpose, the purchaser shall have the option of adopting, as an alternative to the existing flat rate scale of charges, a two-rate tariff as follows: a fixed charge of £4 per annum per kVA of maximum demand, plus ¼d. per kWh, this rate to be subject to the signing of an agreement embodying a clause adjusting the price per kWh according to the price of coal and providing for a minimum annual payment, the total charge as above defined to be subject under present prices to an increase of 10 per cent.

South-East Lancashire Electricity Advisory Board.—Special Order.—The Engineering Advisory Committee has recommended the Board to support the application made by the Hazel Grove and Bramhall Urban District Council for a Special Order authorising it to supply electricity in the parish of Woodford and part of the parish of Poynton, in the rural district of Macclesfield.

Operating Statistics.—For the quarter ended June last, the total energy delivered to the feeders was 240,741,973 kWh, as compared with 221,400,347 kWh for the corresponding quarter of the preceding year, and the cost per kWh was .242d., as against .257d.

Transmission Line.—The Board has been recommended to approve the establishment of a main transmission line between Hazel Grove and Buxton by the Trent Valley and High Peak Electricity Co., Ltd., the estimated cost of the work being £29,349.

The minutes of the Engineering Advisory Committee have been approved by the Board.

Southend-on-Sea.—Inquiry.—Col. T. C. Ekin will hold an inquiry on November 6th into the application of the Town Council for a loan of £66,000 for the installation of generating

plant and accessories in place of the existing steam generators and Diesel plant.

Loan Sanctioned.—The Town Council has received sanction to a further loan of £25,623 for land, buildings, and mains required in connection with the change-over in certain parts of the borough.

Stoke-on-Trent.—Sub-Station Equipment.—The Corporation Electricity Committee has voted £4,400 for the purpose of equipping the sub-station proposed to be erected in Kingsway, Stoke, and for works in connection with the supply of electricity in the surrounding area.

New Mains.—The Committee has decided to replace mains in Queen Street and Swan Square, at a cost of £1,700.

Tilbury.—Loan.—The Urban District Council has applied for sanction to a loan of £4,309, the balance of the cost of carrying out its electricity scheme.

Torquay.—Electricity Supply.—The Corporation Electricity Committee has adopted a scheme, estimated to cost £2,915, for the supply of electricity to Stoke Gabriel.

United States.—Electrical Developments.—The first unit of the steam-electric plant of the Duke Power Co. at Riverbend, near Mount Holly, N.C., was recently put into operation. It is stated by *Power* that the scheme involves expenditure aggregating several millions of dollars, and that the completion of the plant, which operates with coal as fuel, adds approximately 110,000 kW to the available supply of the Duke company. The generating equipment of the first unit will include two turbo-generators, each with a capacity of 55,000 kW. The plant is the first of several units which it is proposed to erect there as the demand for power produced by this company increase. The ultimate capacity of the plant will be 440,000 kW.

Adding 50,000 h.p. to the electric system of Puget Sound Power and Light Co., Seattle, Wash., the first unit of the Shuffleton steam plant was completed recently. The new plant is situated at the south end of Lake Washington, near Renton, Wash. Through a decision of the company made last spring, work has already been started on the construction of a second unit, which will bring the ultimate capacity of the plant up to 100,000 h.p. The whole project involves an expenditure of $7,000,000.

Walton-on-Thames.—Purchase of Cookers.—The Urban District Council has authorised the expenditure of a further £500 on the purchase of cookers.

Wellington (Somerset).—Electricity Scheme.—The Urban District Council has given its consent to an electricity scheme submitted by Whitehall Securities Corporation, Ltd., which has taken over the undertaking of the Wellington District Electricity Co., Ltd. It is proposed to lay a main transmission line from Exeter, where energy will be taken in bulk from the Corporation's works. The distribution lines will be of the overhead type, and it is hoped that a supply will be available within a year.

Worksop.—Electricity Supply.—Intimation has been received from the Electricity Commissioners that they are disposed to grant the Order sought by the Urban District Council for the extension of its existing area of supply to Whitwell, rather than that the parish should be served by a small and separate undertaking.

Tramway and Railway Notes.

Bristol.—The Tramway Purchase Option.—At a meeting held last week, the City Council decided, by 51 votes to 31, against exercising its option to purchase the undertaking of the Bristol Tramways and Carriage Co., Ltd., for a sum estimated at £1,000,000.

Chatham.—Tramway Abandonment.—The Ministry of Transport has authorised the abandonment of the Chatham and District Light Railways Co.'s tramway system as from September 30th, 1930.

Croydon.—Year's Working.—The accounts of the Corporation Tramways Department (manager: Mr. T. B. Goodyer) for the twelve months ended March 31st last record an increase in the total revenue from £110,521 to £122,779. Working expenses amounted to £116,533, as against £123,448 in the preceding year, leaving a gross profit of £6,246, as compared with a gross deficit of £12,927. Loan and other charges totalled £38,324, and there was a net deficiency of £32,078, as against £50,880 in 1927-28. The capital expenditure during the year amounted to £41,902, the chief item being £38,096 for cars. The car mileage increased from 2,253,762 to 2,283,608, and the number of passengers carried from 18,670,001 to 19,570,164.

Glasgow.—The Pinkston Station.—Tenders have now been received for the reconditioning of the boiler plant at the Pinkston power station of the Corporation Tramways Department. The estimated cost of the reconstruction work is over £200,000. The offers will be submitted to the Committee for approval at an early meeting.

Leeds.—New Tramcars.—The Corporation is to build 150 new tramcars at a cost of £348,000.

London.—The Traffic Situation.—The Underground Group of Companies is engaged upon a careful review of the London traffic situation with a view to submitting proposals to the Minister of Transport for extending and improving the present system. No definite decision can be reached until the whole problem has been carefully considered. An extension of the Piccadilly Railway north of Finsbury Park is the most urgent problem, and the directors are giving special attention to it, since an early decision is necessary if a Bill is to be promoted in the next session of Parliament.

New Zealand.—Wellington.—The accounts of the Corporation Tramway Department (general manager: Mr. M. Cable) for the year ended March 31st last record a total revenue of £451,181 and a working expenditure of £336,448, leaving a gross profit of £114,733. The figures for the preceding year were: Income, £449,930, working expenses, £332,467, gross profit, £117,463. From the gross profit the following charges had to be met: loss on motor-'buses, £13,109; interest on loans, £39,848; sinking fund, £9,314; renewal fund, £21,377; reserve fund, £21,377. There remained a net surplus of £9,708, as compared with £14,367 in 1927-28. The capital expenditure during the year amounted to £54,227, including £10,996 for permanent way, £18,926 for buildings and fixtures, and £10,947 for tramcars. The number of passengers carried increased from 46,832,341 to 47,051,933, but the car mileage fell from 4,164,820 to 4,159,125. The average receipts per car mile rose from 25.92d. to 26.03d.

Salford.—Year's Working.—We have received from Mr. J. S. D. Moffet, general manager and engineer, a statement of accounts of the Corporation's tramway undertaking for the year ended March 31st last. The total income amounted to £458,628 and the working expenses were £374,682, leaving a gross profit of £83,946, to which was added income from investments, &c., making a total of £95,154 available. After providing for loan charges (£70,054), rents of lines (£11,070), and Church Street property (£178), there remained a net surplus of £13,851.

Southend-on-Sea.—Railless Cars.—The Town Council has adopted a recommendation by the Light Railways and Transport Committee to extend the railless-car system in the borough, and also to run motor-'buses outside the town. Five new railless-car routes will be constructed, and a sum of £92,010 is to be expended on the provision of overhead equipment and the purchase of 35 additional railless cars.

Tramway Abandonment.—The Ministry of Transport has authorised the Corporation to abandon its tramway system.

The Great Western Railway.—Carriage Lighting.—A further programme for substituting electric lighting in gas-lighted coaches has been adopted by the G.W.R. The proposal provides for the completion of the equipment of all corridor stock on the company's system, and also all non-corridor coaches containing first-class compartments built since 1900.

The Southern Railway.—Derailment.—The derailment of an electric train at Borough Market Junction, near London Bridge station, at 6.48 a.m. on October 16th caused a blockage of the lines between London Bridge and Charing Cross and London Bridge and Cannon Street. Places as far away as Dorking, Wallington, Croydon, Caterham, Woolwich, and Dartford were affected, and an emergency service had to be run till noon, when normal working was resumed.

United States.—New York.—A plan is to be placed before the Board of Transportation for the construction of a tube railway between Coney Island and the Bronx, upon which trains will be capable of a speed of 60 m.p.h., with stops about five miles apart.

Telegraph and Telephone Notes.

China.—Radio-telegraphy.—A wireless telegraph service has been inaugurated between Wuhutsui and Fuchou, just north of the Kwantung leased territory, chiefly for military service.

Long-distance Telephony.—In North Manchuria, the Chinese long-distance telephone systems comprise the Heilungkiang, the Mukden-Kirin-Heilungkiang, the Harbin-Manchouli-Suihua, and the C.E.R. systems, each being an independent unit. Director Chiang, of the North-Eastern Electricity Administration, Mukden, has made Chen-chiachen, superintendent of the Harbin telephone office additionally director of the North Manchuria long-distance telephone office. The Harbin office has been made the general office, the other offices becoming its branches. Connections are to be effected with the local telephone service.

Colombia.—Radio Stations.—The Government has authorised the International Telephone and Telegraph Corporation in South America to construct a radio station at Bogotá and two additional coast stations, one on the Atlantic Ocean and the other on the Pacific. The concession covers international wireless telephony and telegraph services, a regular service from ship-to-shore and shore-to-ship, and communication to and from aeroplanes.—*Reuter's Trade Service* (Bogotá).

Costa Rica.—Communication Services.—There are now 2,176 miles of telegraph wires in operation in Costa Rica, or 4.6 miles for each 1,000 of the population. The number of telephone instruments in use in the Republic is 18,875, or 2.6 for each 1,000 inhabitants.

Irish Free State.—Automatic Telephony.—In 1922 some 104 exchanges and 552 call offices were in operation; local calls numbered 10,000,000 and trunk calls 77,700. By the close of 1928 there were 678 exchanges and 1,165 call offices in operation, while the number of local calls had grown to 19,265,000, and the number of trunk calls to 177,450. Dublin has now 5,000 automatic telephones in use, and arrangements have been made by the Post Office to have 6,175 installed with 5,575 extensions in the course of the next few months. This increase in automatic telephones was decided on after subscribers with a lengthy experience of the system had been consulted on whether the whole of Dublin should be turned over to automatic working; 60 per cent. voted, of which 90 per cent. were in favour. In 1925 there was only one trunk circuit to Cork; now there are three. The telephone service to England has doubled, and about 15 calls are now put through between Dublin and Liverpool, or London, in a normally busy hour.

Russia.—Radio-Telephony.—The first wireless telephone in the Soviet Union, connecting Moscow with Sverdlovsk, a distance of over 1,000 miles, is now being tested, and will be put into operation at the end of the month.—*Reuter's* (Moscow).

Spain.—Transoceanic Radio-communication.—The King of Spain, General Primo De Rivera, and Mr. G. Marconi inaugurated on October 21st, direct radio communication between Spain and the U.S.A., Brazil, Argentina, and Cuba.

Swedish Telephones.—South America.—A number of important new concessions for the installation of Swedish automatic telephone exchanges are reported by the L.M. Ericsson Telephone Company, of Stockholm. In the town of Mendoza and vicinity, in Argentine, a new Ericsson telephone system with an all-automatic exchange, at present comprising 4,260 lines, but with the total capacity of 50,000 lines, was recently opened by the governor of the province of Mendoza. In the town of Juiz de Fora, in Brazil, the Ericsson Co. will install another all-automatic telephone exchange with a total capacity of 9,000 lines, which will be the most modern installation of its kind in Brazil.

New Zealand.—The towns of Whangarei and Marton, in New Zealand, have both decided to introduce the Ericsson automatic system. The exchanges will be constructed for total capacities of 1,000 and 2,000 lines, respectively.

Switzerland.—Telephony.—The Swiss Post and Telegraph Authorities have included a sum of £30,940 in their annual budget for the establishment of a large new telephone exchange in Zurich. It will at first be equipped for 10,000 connections, capable, however, of subsequent extension to 20,000.

The Telephone Service.—Increased Traffic.—The total number of telephone stations in the British Post Office system on July 31st, 1929, the latest date for which statistics are available, was 1,794,424, an increase of 7,559 on the total at the end of the previous month. London's share was 641,660 stations, an increase of 2,776 for the month, of which 154,943 were residence-rate subscribers (month's increase 835) and 5,671 were call-office stations, including 1,383 street kiosks. The provinces claim 1,152,764, the increase for the month being 4,783; of them 243,647 were residence-rate subscribers (month's increase 4,783) and 22,006 were call-office stations, including 5,468 street kiosks. Ten new rural railway stations were connected with telephone exchange systems, giving a total of 1,173.

Radio Notes.

Cuba.—Legislation.—The Chief of the Radio Bureau of the Cuban Department of Communications has submitted to the secretary of that department a comprehensive report on the way in which radio broadcasting and receiving stations should be established in future on the island of Cuba. Owing to the excessive number of radio telephone and broadcasting stations on the Isle of Cuba, it is necessary to make new allocation of wavelengths as well as to limit the time in which the various stations may operate during the day, so as to avoid interference among them. The power, wavelength, and site of each station have been registered in the Radio Bureau, and the improvements will be enforced as soon as the Secretary of the Department of Communications has had an opportunity of studying the project.

Holland.—Proposed New Station.—The Workers' Broadcast Society (V.A.R.A.) has recently had an interview with the Minister of Waterstaat, who is responsible for the control of wireless in Holland, with a view to obtaining permission to erect its own station. Another point discussed, says *World Radio*, was that of allowing all transmitting associations to be represented on the Radio Council.

Line Relaying.—Brussels Conference.—A brief, but very businesslike, conference on line relaying was held at Brussels on October 8th, 9th and 10th, between delegates of the British, Belgian, and German broadcasting authorities, together with representatives of the Post Offices of those countries. Mr. Marcel van Soust de Borkenfeldt, of Radio-Belgique, was chosen as president, and the delegates met first in two committees, for technical and programme matters, respectively, and then for the discussion of subjects common to both. It will be recalled that the East-Central European countries, *viz.*, Czecho-Slovakia, Austria, Hungary, Poland, and Germany, some time ago carried into effect a scheme for the systematic exchange of programmes by line, and the Brussels Conference is expected by *World-Radio* to be the beginning of a similar linkage for North-Western Europe.

Regional Transmitters.—Northern Plant Contract.—The B.B.C. announces that a contract has been signed for the building of the north regional broadcasting transmitter at Moorside Edge, near Huddersfield. A number of Midland and London contractors were invited to compete, and the successful firm is the Anglo-Scottish Construction Co., Ltd., which was responsible for the erection of the building at the London regional transmitter at Brookman's Park. The work will be carried out under the direction and to the specification of the civil engineer to the British Broadcasting Corporation, and will start immediately. The building will take about a year to complete, and the lay-out will be very similar to that of Brookman's Park.

London Station Change-over.—At 3.30 p.m. on October 21st, the new regional transmitter of the B.B.C. at Brookman's Park took over the whole service for the London area, and the Oxford Street (2LO) station ceased to function.

Russia.—Development.—All broadcasting is controlled by the Radio Department of the Commissariat of the People for Posts and Telegraphs. Commercial concerns are allowed to operate their own transmitters, but the technical management of such stations is controlled by the same authority. There are at present 63 transmitting stations in Russia, but the number of registered listeners is comparatively small, because registration is only compulsory from the month when a district station of from 12 to 20 kW begins to operate. According to *World-Radio*, there are in towns 282,045 registered listeners, and in the country districts 44,240. The total number of listeners, however, is estimated at eight millions. Registered public loud-speaker sets in towns number 9,792, and in the country 6,533, which number does not include those in streets, squares, and public gardens. In the larger towns public loud-speaker systems are installed in such a way that every set can also feed special loud-speakers installed in the private houses around.

Engineering Education in America.

Mr. W. Jackson, M.Sc., informs us that the committee on education of the American Institute of Electrical Engineers states, in its annual report, that the continued rapid increase in scientific knowledge and in the diversity and complexity of engineering applications and engineering responsibilities, makes the present four-year engineering college course a less and less adequate preparation for effective engineering work.

Very few teachers and engineers in America are, however, in favour of meeting the situation by requiring *all* engineering students to remain at college for a fifth or sixth year. Before increasing the length of the engineering course for all students, the engineering profession proposes to encourage the comparatively few graduates of the four-year engineering course who are possessed of the requisite interest, ability, and financial means, to continue in residence by enrolling in the graduate schools, and to encourage the majority, who will enter at once upon their engineering apprenticeships, to continue their educational efforts in a more systematic manner and to a more definite end than at present.

The committee suggests that the local sections of the Institute, particularly in the industrial centres where the engineering colleges are located, should each appoint a committee on education, the duty of which shall be to canvass the needs of the engineers of the district, particularly of the younger engineers, and to bring them to the attention of the college administrations, industrial managements, and engineering authorities in the districts. It is thought that a fully-developed programme of post-graduate education will mean a large expansion of the work of the engineering colleges, and that it will play an important part in the development of engineering teachers. It will afford greater opportunities to determine the adequacy, the relative importance, and the real significance of the principles and methods taught to undergraduates. It will also make teaching more attractive to a wider range of engineers by making it possible for men in teaching to have closer contact with engineering practice.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—November 27th. City Council. 6,600-V, 3-phase switchgear. (B.X. 5706.)*

December 10th. Posts and Telegraphs Department. Switchboard keys and parts. (B.X. 5776.)* Electric lamps, lamp caps, and lamp sockets for telephony purposes. (B.X. 5783.)*

December 17th. Telephone fuses, heat coils, and protectors. (B.X. 5784.)* Loading-coil pots. (B.X. 5785.)* Secondary batteries. (B.X. 5777.)*

November 27th. Victorian Government Railways. Automatic oil switches. (B.X. 5735.)* Indication transformers for railway signalling, with a no-load ratio of 100/6 V. (B.X. 5737.)*

March 30th. D.c. neutral relays for power-signalling purposes. (B.X. 5793.)*

December 9th.—State Electricity Commission of Victoria. 3,000-kVA transformers and spares. (B.X. 5775.)*

Ayr.—October 31st. Northern District Committee. Electric lighting at housing schemes. Particulars from District Offices, Kilwinning.

Bridgend.—November 18th. Mid-Glamorgan Water Board. Pumping station and ancillary works at Schwyll, Ewenny, near Bridgend. Electrical transformers, switchboard, meters, &c. Electric lighting, two centrifugal pumps, heating apparatus, electrical depth transmitters on various reservoirs, with cables and electric lines connecting with the pump house. Specifications from Messrs. Thomas & Morgan & Partners, Pontypridd.

Canada.—Toronto.—November 5th. Department of Works. One 10-million gallon centrifugal pump and electric motor complete with bed-plate, switchboard and accessories. (A.X. 8703.)*

Chile.—Santiago.—November 14th. Chilean State Supply Department. Telegraph material. (B.X. 5746.)*

Derby.—November 4th. Derbyshire County Council. Electric lighting installation at Bretby Hall Hospital, near Burton-on-Trent. Messrs. Martin & Martin and T. H. Ward, 106, Colmore Row, Birmingham. (Deposit £1 1s.)

Egypt.—Cairo.—November 19th. Ministry of the Interior. One Diesel-electric generating set for the Manfalout power station. (B.X. 5720.)*

November 30th. Diesel engine-driven electric lighting installation at Abou-Tig (Assiut Province). (B.X. 5791.)*

Glasgow.—October 28th. Corporation Lighting Department. Electric cable, steel poles, lanterns, and cast-iron bases for street lighting. Specifications, &c., from Inspector of Lighting, 20, Trongate.

India.—Delhi.—India Stores Department. November 12th. Battery charging motor-generators and oil switch. (B.X. 5774.)*

November 14th. Crude-oil engine-driven d.c. generating set and a motor-generator set, with switchgear, for the Military Engineering Services, Razmak. (B.X. 5744.)*

October 28th. House service meters for 12 months. (B.X. 5749.)*

November 18th. Two 20-kW oil-driven d.c. generators, water-softening plant, and overhead travelling crane. (B.X. 5757.)*

London.—Central Electricity Board.—November 9th. Supply, delivery, and erection of 33,000-V overhead transmission lines in South Lincolnshire. (September 27th.)

Metropolitan Asylums Board.—October 30th. Installation of central battery telephone system at South-Western Fever Hospital, London Road, Stockwell, S.W. (See this issue.)

New Zealand.—Wellington.—Post and Telegraph Department. November 18th. Resistance spools. (B.X. 5716.)*

October 29th. Telephone cable. (B.X. 5788.)*

November 19th. Telephone transformers. (B.X. 5718.)* Automatic wall and table telephones. (B.X. 5717.)*

March 11th. Public Works Department. 110-kV switchgear for interconnecting auto-transformers for the Waikato power scheme. (B.X. 5797.)* Switchgear and controlling equipment for Timaru. (B.X. 5798.)* 66-kV switchgear and protective system for Lyttleton, Lake Coleridge scheme. (B.X. 5796.)*

Smethwick.—Education Committee. Electric heating of Uplands School, shortly to be erected in two blocks. (See this issue.)

South Africa.—Johannesburg.—City Council. October 31st. Three-phase and single-phase outdoor transformers. (B.X. 5736.)*

Wakefield.—October 28th. West Riding Education Committee. Installation of electric light in the Whitwood Mining and Technical School. Education Officer, County Hall, Wakefield.

Wolverhampton.—November 15th. West Midlands Joint Electricity Authority. Two 6,600-kVA, two 1,200-kVA, and two 150-kVA transformers for Ironbridge power station. (See this issue.)

* Further particulars can be obtained at the department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Arbroath.—Board of Guardians. Accepted:—
Electric lighting of the Infirmary extension (£635).—Edmiston, Brown & Co., Ltd., Glasgow.

Australia.—Broken Hill.—North Broken Hill, Ltd., Broken Hill South, Ltd., Zinc Corporation.

Equipment for the central power station to be erected at Broken Hill to supply electricity and compressed air to the companies' mines:—

Six sets of 3,000-h.p. Diesel-driven electric generators and four sets of 1,200-h.p. Diesel-driven air compressors. The Diesel engines are to be supplied by Sulzer Bros. and the generators by the British Thomson-Houston Co., Ltd.

Diesel engines for compressors, switchgear, and accessories.—Australian General Electric Co., Ltd. (Diesel engines by Mirrlees, Bickerton & Day, Ltd.; air compressors by Belliss & Morcom, Ltd.)

Melbourne.—Postmaster-General's Department.

Underground and aerial cable (£62,028).—British Insulated Cables, Ltd.

Telephone switches (£2,637).—British General Electric Co., Ltd.

Secondary batteries. — Automatic Telephones, Ltd. (£3,070); Coates & Co. Pty., Ltd. (£616); T. K. Steames & Son (£374).

Carrier power boards and associated equipment.—Metropolitan Switchgear Pty., Ltd. (£1,981); McKenzie and Holland (Aust.) Pty., Ltd. (£955).

—*Tenders.*

Glasgow.—Electricity Committee. Recommended:—

Thirteen rotary convertors, reconstructed (£21,350).—Metropolitan-Vickers Electrical Co., Ltd. Five ditto (£11,428).—Bruce Peebles & Co., Ltd. Two ditto (£1,386).—English Electric Co., Ltd.

New and reconstructed rotary-convertor plant (£16,148).—British Thomson-Houston Co., Ltd.

Two rectifiers (£2,594).—Hewittic Electric Co., Ltd.

Re-winding alternator (£9,800).—C. A. Parsons & Co., Ltd.

One transformer (£495).—Ferranti, Ltd.

20,000-V cable (£304).—Callender's Cable and Construction Co., Ltd.

5,000 meters, reconditioned (£4,187).—Chamberlain and Hookham, Ltd.; Ferranti, Ltd.; Edison Swan Electric Co., Ltd.; and Metropolitan-Vickers Electrical Co., Ltd.

3,800 electric fires.—Belling & Co., Ltd.

50 time switches.—Venner Time Switches, Ltd.

Douglas (I. of M.).—Markets Committee. Accepted:—
Electric lighting at abattoir.—Lawton & Co.

Dundee.—Electricity Committee. Accepted:—
Cables (£5,796).—Derby Cables, Ltd.

Egypt. — Cairo — Gabbary power house extensions.—The Egyptian State Railways have received 20 British and Continental tenders for the extensions to the Gabbary power house. The lowest price quoted was £E63,347 by the Ateliers de Constructions Electriques de Charleroi, and the highest, £E102,290, by Krupps. The lowest British tender was that of the English Electric Co., Ltd., at £E64,865. The Metropolitan-Vickers Electrical Co., Ltd., quoted £E69,802 and the General Electric Co., Ltd., £E71,326.—*Reuter's Trade Service* (Cairo).

Government Contracts.—The following contracts were placed by the various Government Departments during September, 1929:—

Admiralty Contract and Purchase Department.

Battery gear.—Chloride Electrical Storage Co., Ltd.
Junction boxes.—Engineering and Lighting Equipment Co., Ltd.
Electric cable.—Croydon Cable Works, Itd.; Pirelli-General Cable Works Ltd.
Electric capstan.—Cowans, Sheldon & Co., Ltd.
Air compressor.—Reavell & Co., Ltd.
Electric crane.—Cowans, Sheldon & Co., Ltd
Ship ventilating fan.—Electro Dynamic Construction Co., Ltd.; James Keith & Blackman Co., Ltd.; Mawdsley's, Ltd.; Veritys, Ltd.
Electrical installations.—Johnson & Phillips, Ltd.
Electric lamps.—General Electric Co., Ltd.
Valves (wireless).—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Electric winches.—Clarke, Chapman & Co., Ltd.

War Office.

Maconite wiring system.—Macintosh Cable Co., Ltd.
Electric meters.—Measurement, Ltd.; General Electric Co., Ltd.
Valves, w/t.—General Electric Co., Ltd.
Wireless-telegraph sets.—Radio Instruments, Ltd.; Marconi's Wireless Telegraph Co., Ltd.
Steam turbine generating set and switchboard.—Greenwood & Batley, Ltd.

Air Ministry.

Internal wiring (Boscombe Down).—S. Dixon & Son, Ltd.
Cable.—General Electric Co., Ltd.
Fuse boxes.—D. H. Bonnella & Son, Ltd.
Receivers.—H. W. Sullivan, Ltd.
Switches.—English Electric Co., Ltd.; Metropolitan-Vickers Electrical Export Co., Ltd.
Transmitters.—Gambrell Bros., Ltd.
Transmitters and receivers.—Siemens Bros. & Co., Ltd.

H.M. Office of Works.

Wiring (Welwyn Garden City).—R. Langston Jones and Co.
National Physical Laboratory switchgear.—English Electric Co., Ltd.

Post Office.

Telegraph apparatus.—Creed & Co., Ltd.
Telephone apparatus.—Ericsson Telephones, Ltd.; International Electric Co., Ltd.; Standard Telephones and Cables, Ltd.; Telephone Manufacturing Co., Ltd.
Battery-charging sets.—Stuart Turner, Ltd.
Battery boxes.—Ericsson Telephones, Ltd.
Cable.—British Insulated Cables, Ltd.; Connolly's (Blackley), Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Joint-box castings.—General Foundry and Engineering Co., Ltd.
Cable drums.—British Insulated Cables, Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe and Firebrick Co., Ltd.; Doulton & Co., Ltd.; Hepworth Iron Co., Ltd.; J. Jamieson & Son, Ltd.; G. Jennings; Jas. Oakes & Co. (Riddings Collieries),) Ltd.; Oates & Green, Ltd.; J. Place & Sons, Ltd.; Standard Brick and Terra Cotta Co., Ltd.; Stanley Bros. and Co., Ltd.; Sutton & Co. (Overseal), Ltd.
Dynamotors.—W. Jones & Co.
Ebonite.—General Electric Co., Ltd.; India Rubber, Gutta Percha & Telegraph Works Co., Ltd.
Thermionic valves.—General Electric Co., Ltd.; Standard Telephones & Cables, Ltd.
Batteries (Blackburn telephone exchange).—Chloride Electrical Storage Co., Ltd.
Electric lighting (Paddington district post office).—Alpha Manufacturing and Electrical Co., Ltd.
Radio equipment (London repeater station).—Standard Telephones and Cables, Ltd.
Telephone exchange equipment.—G. Clark & Son, Ltd., Millwall Docks, E.14: Relay Automatic Telephone Co., Ltd. North (London) Terminus (W.C.), Paddington, Wembley, Hounslow, Lee Green, Ravenbourne, and New Cross: Automatic Telephone Manufacturing Co., Ltd. Rochdale: Standard Telephones and Cables, Ltd. Scotstoun (Glasgow): Ericsson Telephones, Ltd. Sub-contractors: Crompton Parkinson, Ltd., for motor generators and ringing machines; Chloride Electrical Storage Co., Ltd., for batteries. Hindhead and Whitehall: Siemens Bros. & Co., Ltd. Sub-contractors: English Electric Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines; Hart Accumulator Co., Ltd., for batteries.

Crown Agents for the Colonies.

Battery.—D.P. Battery Co., Ltd.
Cable.—W. T. Henley's Telegraph Works Co., Ltd.
Conductors.—British Insulated Cables, Ltd.
Electric lamps.—General Electric Co., Ltd.
Switchgear.—English Electric Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
Telephones.—Ericsson Telephones, Ltd.

Liverpool.—City Council. Recommended:—
Main and auxiliary switchgear for the new Clarence Dock generating station (£72,651).—British Thomson-Houston Co., Ltd.

London.—Stepney.—Electricity Supply Committee. Recommended:—
Pipework for Limehouse generating station extensions (£7,802).—Aiton & Co., Ltd.
Distribution boxes (£237).—W. Lucy & Co., Ltd.
Condenser tubes (£385).—Yorkshire Copper Works, Ltd.
Solder (£341).—Locke, Lancaster and W. W. & R. Johnston & Sons, Ltd.
Stoke Newington.—Electricity Committee.
Rotary converting plant and switchgear (£8,325).—General Electric Co., Ltd.
E.h.p. cable (£2,400 approx.).—W. T. Henley's Telegraph Works Co, Ltd.
Annual contracts:—
L.p. cables.—Croydon Cable Works, Ltd.
Installation work in private premises under the Council's wiring scheme.—Andstro (A.A.) Electric (18s. per point) (for 4 to 6 points wired in lead-covered cable system).
St. Pancras.—Contracts and Stores Committee.
Cable (£1,723).—Standard Telephones and Cables, Ltd.
Shoreditch.—Electricity Committee.
Converting equipment for Hearn Street sub-station:—
Mercury-vapour rectifiers (£8,967).—Hewittic Electric Co., Ltd. (Recommended.)

Lanarkshire.—County Council. Accepted:—
Electrical work at the new Glasgow offices (£1,449).—Johnston, Park & Co., Ltd.

Louth.—Town Council. Accepted:—
Cable and street works (£12,818).—Power Lines, Ltd.
Sub-station equipment (£1,312).—Crompton Parkinson, Ltd.

Stafford.—Corporation. Accepted:—
Overhead cable to the Stafford Timber Co.'s works (£292); transformer (£120).—English Electric Co., Ltd.

Stoke-on-Trent.—Hospital Committee. Accepted:—
Electrical services at new cubicle block and garage of isolation hospital (£216).—Barnett & Soans.
Electric lighting installation at Stallington Hall (£370).—Painter & Madew.
Stores Purchase Committee. Accepted:—
Electric lamps.—Blackburn, Starling & Co.; Barnett and Soans; and Robinson & Hands Electric Co., Ltd.

Forthcoming Events.

North-East Coast Institution of Engineers & Shipbuilders.—Friday, October 25th. Literary and Philosophical Society, Newcastle-on-Tyne. 6.30 p.m. Annual General Meeting.

Institution of Railway Signal Engineers.—Friday, October 25th. Criterion Restaurant. Annual Dinner.

Birmingham Electric Club.—Friday, October 25th. Grand Hotel. 7 p.m. "Motor Users and the Frequency Change." Mr. T. A. Windibank.

Physical Society.—Friday, October 25th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Junior Institution of Engineers.—Friday, October 25th. 39, Victoria Street, S.W. 7.30 p.m. "Electric Welding as applied to Bridges and other Structures." Mr. H. Bruff.

Faraday House Old Students' Association.—Friday, October 26th. Savoy Hotel, 6.30 for 7 p.m. Annual Dinner.

Institution of Electrical Engineers.—Informal Meeting.—Monday, October 28th. Institution, Victoria Embankment, W.C. 7 p.m. "Systematic Research by Industrial Undertakings." Opened by the President.

(Meter and Instrument Section).—Friday, November 1st. Institution, London, W.C. 7 p.m. Inaugural address by the Chairman, Mr. E. W. Hill.

(North-Midland Centre). — Tuesday, October 29th. Hotel Metropole, Leeds. 7 p.m. Address by the Chairman, Mr. T. Roles.

(West Wales (Swansea) Sub-Centre).—Friday, October 25th. Corporation Showrooms, Swansea. 6 p.m. Address by the Chairman, Mr. J. W. Burr.

(North-Eastern Students' Section).—Friday, October 25th. Armstrong College. 7.15 p.m. Address on the work of the British Electrical Development Association.

Association of British Radio Societies.—Monday, October 28th. Albert Hall, Manchester. 7.30 p.m. "The Ideal Loud-Speaker." Dr. N. W. McLachlan.

County Borough of West Ham Electricity Department.—Monday, October 28th. Holborn Restaurant, Holborn, W.C. 7 p.m. Dinner—Farewell to Mr. Purse, Welcome to Mr. Townley.

Association of Supervising Electrical Engineers.—Tuesday, October 29th. Lighting Service Bureau, Savoy Place. "Various Applications of Indirect Lighting with Special Reference to Public Buildings." Mr. W. J. Jones.

Institution of Mechanical Engineers.—Friday, November 1st. Institution, Storey's Gate, S.W. 6 p.m. Thomas Hawksley Lecture. "Critical Relations between Water and Steam." Prof. H. L. Callendar.

Electrical Power Engineers' Association (West Yorkshire Section).—Saturday, November 2nd. Great Northern Hotel, Leeds. 5.30 for 6 p.m. Annual Dinner.

Royal Society of Arts.—Wednesday, November 6th. John Street, Adelphi, W.C. 8.30 p.m. "Fifty Years of Electrical Science and Industry." Mr. Ll. B. Atkinson.

Salford Technical & Engineering Association.—Saturday, November 2nd. Royal Technical College. 7 p.m. Short Papers in competition for the gold medal awarded by Mr. W. O. Larmuth.

Notes.

Breaches of Electricity Regulations.

At the Kidderminster Petty Sessions recently, the West Midland Sugar Co., Ltd., was summoned for an alleged breach of the Electricity Regulations relating to factories.

It was stated by the prosecution that an employé at the company's works, Foley Park, received a shock and sustained injuries while using a portable lamp with an exposed metal part which was not earthed.

Witnesses for the defence stated that all the portable lamps used in the factory were of the proper kind and the one in question was in use without the company's knowledge.

The Bench held that the case had been proved and imposed a fine of £10 with 19s. costs.

The hearing was resumed at Lambeth Police Court on October 16th of a summons against the County of London Electric Supply Co., Ltd., for an alleged breach of the Electricity Regulations under the Factory and Workshops Act, 1901. As we reported in our issue of September 13th (p. 446) the case arose from injuries sustained by an employé named Morgan who came into contact with some unprotected "live" apparatus in a transformer station at Rye Lane, Peckham.

The prosecution maintained that the apparatus in question should have been screened or made "dead." The company said that Morgan was an experienced man. Instructions had been given for the terminals to be screened and the part on which Morgan was actually working was "dead."

The Magistrate said that experienced people often needed protection on account of over-confidence. He found the case proved and imposed a fine of £35 with £15 15s. costs.

The Huddersfield magistrates last week fined the Huddersfield Corporation £10 for having allowed cleaning to be done to a switchboard at the Corporation electricity works without the board having been rendered dead. The case arose out of an accident to a youth while cleaning the board. The prosecution contended that the youth, Sykes, was certain that he was not told that the cubicles were alive when he was put on to clean the switchboard with a handbrush. Mr. W. Brown, Divisional Inspector of Factories, said he thought Sykes's brush must have established contact with one of the links of the cubicles. In answer to Mr. Spencer, for the Corporation, witness said that the regulations laid it down that the board must be dead before even the top or back could be cleaned. Mr. Spencer said that that would mean leaving a section of the town without electricity for a time. Mr. Saywell, for the Director of Public Prosecutions, replied that commercial practicability did not matter. Mr. Spencer contended that Sykes undertook work which he was not asked to perform, being told to clean the back of the switchboard only. He argued that the top and back of the switchboard, which were insulated, and could not possibly be dangerous, were not part of the board. Mr. J. W. Turner, borough electrical engineer, said that cubicles on the switchboard were cleaned out once a year. The job was a serious one, as it meant that a section of the town was cut off for a time. The weekly cleaning of the switchboard was performed by a trained man without the board being made dead.

W. E. Highfield Shield Competition.

The results of the 1929 competition for the W. E. Highfield Shield and prizes recently held under the auspices of the Association of Supervising Electrical Engineers are now to hand as follows:

Members' Section: 1st Prize (value £5 5s.), presented by British Insulated Cables, Ltd.; Mr. D. J. Williams, for his paper "Public Lighting"; 2nd Prize (£3 3s.), presented by Messrs. Berry's Electric (1928), Ltd.; Mr. E. E. Gammon for his paper "Light: Dominating Influence of Window Display"; 3rd Prize (£2 2s.), presented by Messrs. Turner Bros. Asbestos Co., Ltd.; Mr. G. Kirk for his paper "Advancement in the Application of Electricity."

Associates' Section: 1st Prize (value £4 4s.), presented by Messrs. Ferranti, Ltd.; Mr. F. Anderson for his paper "Control Boards for Super-power Stations"; 2nd Prize (£2 2s.), presented by the Editor of "Electricity"; Mr. A. Simpson for his paper "Advantages of Interpoles on d.c. Generators."

Mr. D. J. Williams, as winner of the first prize in the Members' Section, also wins the Highfield Shield which he holds for one year.

Appointments Vacant.

Electrical engineer (£480) for the Government of Nigeria Public Works Department. Mains assistant for York Corporation. Full-time lecturer in the electrical engineering section of the Engineering Department of Halifax Technical College. Engine and boiler fitter at the Surrey County Sanatorium, Milford. Jointer linesman for Kettering Urban District Council Assistant mains engineer for Bexley Urban District Council. (See our advertisement pages to-day.)

The Union of the Scottish Churches.

The recent decision of two important Scottish churches to unite was historic, and in celebration of the event the headquarters of the two churches in Edinburgh (the Tolbooth Established Church of Scotland Assembly Hall and the United Free Church Assembly Hall) were floodlighted. The latter

The Union of the Scottish Churches.

building, which is situated on the mound facing Princes Street, is shown in the accompanying illustration. The spire seen in the centre is that of the other building, which is some distance away. The photograph, taken from Princes Street, thus appears to combine the two headquarters in physical union.

"Light's Golden Jubilee."

President Hoover, Mr. Henry Ford, and a group of notable people, assembled in Detroit, Michigan, on October 21st., to pay tribute to Mr. Thomas Edison, and to take part in the elaborate ceremonies commemorating "Light's Golden Jubilee" on the fiftieth anniversary of Mr. T. A. Edison's contribution to the perfection of the incandescent electric lamp. To provide an appropriate setting for the celebration, Mr. Ford had erected near his workshops a full-sized replica of Mr. Edison's nineteenth century workshop, where, fifty years ago, the inventor produced his first electric lamp bulb. At a dinner President Hoover addressed the nation through 150 wireless stations, and dedicated the Edison Institute of Technology, constructed by Mr. Ford in honour of his friend. Among those present at the dinner were Mr. Owen Young, General Dawes, and Mme. Curie. The perfection of the incandescent electric bulb cannot fairly be placed to the sole credit of Mr. Edison. It is clear that the actual discovery of using a carbon filament in an exhausted glass vessel was male as long ago as 1860 by an English inventor, the late Sir Joseph Swan.

The Leon Gaster Memorial Fund.

Nearly two years have elapsed since the death of Mr. Leon Gaster, founder, vice-president and honorary secretary of the Illuminating Engineering Society. To commemorate the great services which he rendered to the Society and to illuminating engineering during nearly 20 years, the Council has accordingly

decided to institute a Leon Gaster Memorial Fund and it is proposed that a fund of not less than £200 shall be collected, the interest on which shall be devoted primarily to the establishment of a premium to be awarded annually for the best contribution from a subscribing member of the Society on any aspect of illuminating engineering which is submitted to the Society during the year. Promises of contributions from 5s. to £5 5s. have already been received and it should be possible to establish a memorial which will worthily commemorate Mr. Leon Gaster's lasting services to illuminating engineering. Contributions should be sent to the honorary secretary (Mr. J. S. Dow, 32, Victoria Street, London, S.W.1).

E.P.E.A. Annual Dinner.

The eleventh annual dinner given by the Southern Division of the Electrical Power Engineers' Association to the members of the National Executive Council was held at the Hotel Cecil, London, on October 19th, under the chairmanship of Mr. E. Rendell Ingham. About 480 members and guests were present.

After the loyal toast, the health of the Association was proposed by Mr. Frank Hodges, J.P., of the Central Electricity Board, who made an "impassioned speech" regarding recent agitations against the proposals of the Central Electricity Board. Everybody was anxious to preserve rural beauty, and there were organisations formed for that purpose. There were, however, individuals also who hid behind such organisations and exploited them for personal ends. The Board had not hitherto raised its voice in the matter, because it awaited the decision of the Judicial Court set up under the Act of 1926. That court had sat for ten days under an inspector appointed by the Minister of Transport; the inspector made his report in favour of the Board's scheme. One would have thought that that would have ended the agitation; nevertheless, attempts were being made to upset the Court's decision. If another body, such as a trade union, had, after the issue of an arbitration award, struck for its original demands, public opinion would describe such conduct as dastardly and unpatriotic. Town dwellers were not the people who tried to prevent the countrymen from having electricity, but private interests which were concerned with private amenities only. With regard to Battersea, science would not be found wanting to prevent the damage to property that some feared.

Mr. T. D. Martin, A.M.I.E.E., president of the Association, responding, compared present methods of purchasing electricity to the Chinaman's plan (in Charles Lamb's essay) of burning down a house to obtain roast pig. He hoped the invention of "grid iron" would make possible a more efficient production than that under which 67 per cent. or so, even under the best conditions, was all the consumer got out of every pound of coal. Regarding the progress of the Association, its health was shown by its ability to reform from within in conformity with evolution from without. The success of its Whitley Council was shown by the fact that only once had arbitration been necessary. There would be fewer generating stations on account of the activities of the Central Electricity Board, to whom he commended the suggestion that the cost of compensation to displaced officials should be borne, not by the small undertakings, but by the industry as a whole. The toast of "Our Guests" was proposed by the chairman.

Mr. F. W. Purse, M.I.E.E. (chief engineer, London and Home Counties Joint Electricity Authority), briefly replied. He referred to the keen interest taken in their work by the younger members of the profession, whom he advised to "drive their business and not to let their business drive them."

Mr. A. V. Sendall (senior vice-president), in an amusing speech, formally presented Mr. A. C Stewart, B.Sc., the immediate past-president, with a cabinet gramophone, and Mrs. Stewart with an emerald and diamond ring. Mr. Stewart, in expressing his thanks, said that, as the father of the National Executive Council—he had served nine years—he considered that the future of the Association was in the right hands. Mr. W. S. Jeffery then presented Mr. J. N. Waite (city electrical engineer, Hull) with an illuminated address and a lucky gold pig; the reason for the latter gift is too long a story for insertion here. He reminded members that Mr. Waite would have been president, but for his promotion and the exacting nature of his new duties. Mr. Waite had also been the initiator of the technical side of the Association's activities, and had done a very great deal towards giving the *Electrical Power Engineer* its position as a technical journal.

A just tribute was paid by the chairman to the excellent arrangements made by Mr. P. Gordon Hieatt for a most enjoyable evening. This was the eighth successive annual dinner organised by Mr. Hieatt. The programme of entertainment was once more arranged by Mr. Sydney Warwick, and the high standard of previous years was well maintained.

The New Oldham Power Station.

The new electricity generating station of Oldham Corporation at Slacks Valley—a selected station under the "Grid" scheme—was formally opened on October 16th by Councillor Charles Hardman, J.P., chairman of the Oldham Corporation Electricity Committee, in the presence of a company of some 200 guests. The occasion was graced by the presence of Sir Andrew Duncan, M.A., LLB.., chairman of the Central Electricity Board, who started the plant, and Mr. Archibald Page, chief engineer to that Board. The new station, which has cost a quarter of a million pounds, has a present generating capacity of 37,500 kilowatts, and is designed for an ultimate capacity of 150,000 kilowatts.

Councillor Hardman, in opening the main door of the works, said the committee had been faced with considerable difficulty in finding a site for the works owing to water requirements. The estimate for the building and completion of the works had been £15 per kilowatt installed, but it had only cost actually £13 per kilowatt installed. If the cotton trade improved as it had been doing lately, he thought they could safely proceed with the installation of a further 50,000 kilowatts, which would bring down the cost to the neighbourhood of £10 per kilowatt installed.

At a luncheon gathering, Sir Andrew Duncan proposed a toast to the Oldham Electricity Undertaking, and said when the station was completed it would be one of the biggest in the country. Apart from Oldham's domestic needs, the works had become part of the link of Agecroft-Chadderton-Hartshead which, it was hoped, would serve the north-western area under the Central Electricity Board's scheme.

In supporting the toast, Alderman Frith referred to the saving in coal consumption as between the old plant and the new at Oldham. The cost of the coal used per unit generated in 1911 was 7.66d., and to-day was 2.30d.

Councillor Hardman, responding, reviewed the history of development of the Oldham electricity undertaking. In the year ended March last it sold 48¼ million units, the revenue was £240,000, and a profit of £26,000.

Sir John Brooke, Electricity Commissioner, responded to the toast of "Our Guests."

Councillor Shepherd, giving the toast of "The Contractors," mentioned that the whole of the new plant was British manufacture.

Sir Philip Nash, chairman of Metropolitan-Vickers, Ltd., responding on behalf of his firm and of the sub-contractors—Messrs. Babcock & Wilcox; the Brightside Foundry; the Premier Cooler & Engineering Co.; and Ferguson, Pailin, Ltd.—handed to Mrs. Hardman a silver tea and coffee service in appreciation of the contractors' happy relationships with her husband, the chairman of the Oldham Electricity Committee.

Alderman W. E. Freeman proposed "The Engineers," and said Mr. Blackmore, the consulting engineer, and Mr. Ogden, the borough electrical engineer, worked together like David and Jonathan. Alderman Freeman presented, on behalf of the committee, a silver tray to Mr. Ogden.

Mr. Blackmore and Mr. Ogden briefly responded.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Hammersmith Borough Council Establishment Committee recommends that Mr. G. L. Law, deputy engineer and manager of the Barnes U.D.C. electricity undertaking, be appointed to the position of deputy borough electrical engineer and manager of the Hammersmith Borough Council electricity undertaking at a commencing salary of £800 per annum. Sixty applications were received.

The committee recommends that a payment of £169 be made to Mr. R. H. Paterson, borough electrical engineer, in recognition of his services as acting borough electrical engineer following the death of his predecessor (Mr. F. Hill) until July 17th, 1929.

Madame Curie, who with her husband discovered radium 20 years ago, recently sailed from France to America on the *Ile de France*.

Mr. S. E. Monkhouse, M.I.E.E., has been appointed chief assistant to the general manager of the Newcastle-upon-Tyne Electric Supply Co., Ltd. Mr. Monkhouse, who has been with the company for 25 years, has, during the past few years, acted as chief of the company's Power Department. Mr. E. H. E. Woodward, M.I.E.E., who has been with the company for over 20 years, has been appointed technical assistant to the general manager.

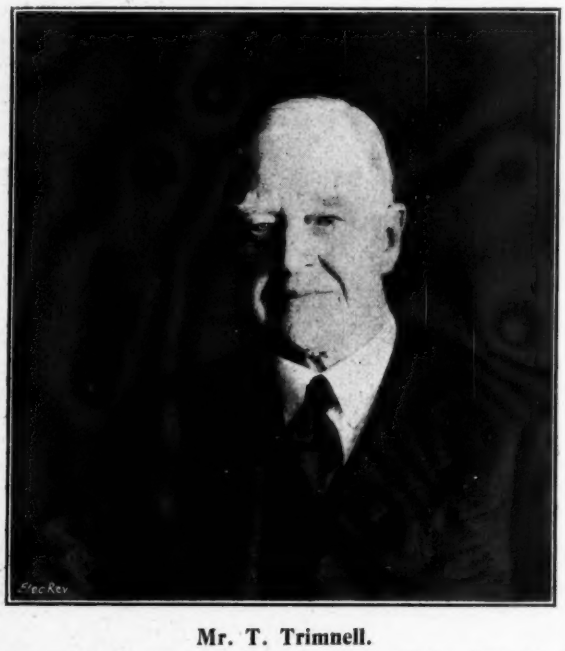
The Southend-on-Sea Town Council has placed on record its high appreciation of the services rendered to the borough by Mr. Robert Birkett, borough electrical engineer for over 24 years, and expressing a hope for his restoration to health, and for his happiness in his retirement. The resolution is to be inscribed on vellum and presented to Mr. Birkett.

Mr. Wm. Crawford, managing director of the Z Electric Lamp & Supplies Co., Ltd., states that as and from November 1st, Mr. H. A. Spreadbury will act with him as joint managing director of the company.

On Monday last the Plymouth Corporation Tramways and Transport Committee appointed Capt. Clement Jackson general manager and engineer of its undertaking, in succession to Mr. H. P. Stokes, who is taking up another appointment. Capt. Jackson is at present acting in a similar capacity at Oldham.

The Bedford Corporation Electricity Committee recommends the appointment of Mr. W. McD. Tait, mains engineer, Winchester, and Mr. N. Boydell, assistant mains engineer, Southport, as district engineers.

At the last annual meeting of the National Register of Electrical Installation Contractors it was announced that Mr. T. Trimnell desired to relinquish the position of solicitor and secretary of the Register on account of the calls of his legal



Mr. T. Trimnell.

The retiring Solicitor and Secretary to the National Register.

practice. Mr. Trimnell, whose portrait accompanies this note, has now resigned and is succeeded by Mr. A. Montgomery who has had considerable experience of the electrical industry. A great deal of the success which the Register has achieved has been due to the assiduous attention which Mr. Trimnell has paid to the organisation since its inception. He will continue to act in a consultative capacity.

At a bridge drive recently organised by the South Wales and Monmouthshire Branch of the Electrical Association for Women and held at Cardiff, Mrs. J. Tyler, the retiring honorary secretary of the branch, was presented with a cheque on behalf of the members. Mrs. C. T. Allan (chairman) made the presentation. Since the inception of the branch three years ago nearly 300 members have been enrolled.

It is announced that Dr. C. V. Drysdale, O.B.E., Superintendent of the Admiralty Research Laboratory, has been appointed Director of the Scientific Research and Experiments Department of the Admiralty in succession to Dr. F. E. Smith, C.B., C.B.E., F.R.S., who is the new Secretary to the Department of Scientific and Industrial Research.

We reproduce with this note a portrait of Mr. B. A. Robinson, who delivered his address as chairman of the North-Eastern Centre of the Institution of Electrical Engineers on Monday last, October 21st. Mr. Robinson was educated at the Portsmouth Technical College, Regent Street Polytechnic, and Finsbury Technical College (under Silvanus P. Thompson), and received his early electrical training at the G.P.O., St. Martin's-le-Grand, between 1905 and 1907. From the latter year until 1910 he was assistant engineer to the Amalgamated Radio-Telegraph Co., Ltd., and was then for two years engineer to the Poulsen Radio-Telegraph Syndicate. He was thus intimately connected with early radio research, and especially the development of high-speed telegraphy, using the earliest forms of Einthoven galvanometer. In 1912 Mr. Robinson joined the Cambridge Instrument Co., Ltd., under the late Sir Horace Darwin, and since that date has been associated with that company in the technique of measurement in many fields of science and engineering. He became resident technical engineer for the company at Newcastle-on-Tyne in 1919. Mr. Robinson, in view of his long experience, is a recognised authority in the North of England upon questions of measurement. His connection with the I.E.E. began in 1910, when he became a student; he was vice-chairman of the Students'

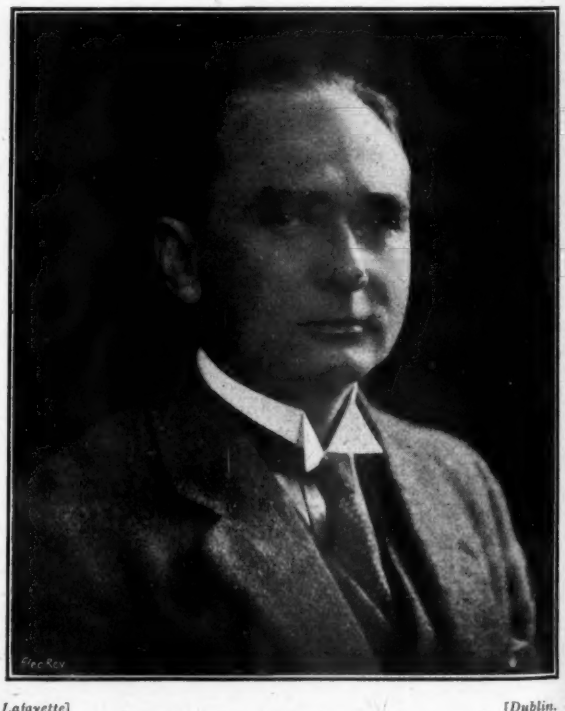
Elliott & Fry] *[London.*

Mr. B. A. Robinson, M.I.E.E., A.M.I.Mech.E.

Chairman of the North-Eastern Centre of the I.E.E.

Section in 1911, and chairman in the following year. He was elected an associate member in 1916, and member in 1923, and served as vice-chairman of the North-Eastern Centre in 1927.

We reproduce below a portrait of Mr. L. A. Baumann, who, as structural engineer to the Irish Free State Electricity



Lafayette] *[Dublin.*

Mr. L. A. Baumann.

Structural Engineer for the Shannon Scheme.

Supply Board, is in charge of the steel transmission line structures and outdoor sub-stations of the Shannon hydro-electric scheme. Mr. Baumann was born in Norway in 1887, and took his civil engineering degree at Trondhjem Polytechnical Institution in 1911. From 1911 to 1921 he was con-

cerned with the planning and construction of hydro-electric undertakings, and until 1926, when he received his present appointment, he was engaged in the construction of transmission systems in Norway.

Fulham Borough Council Electricity and Lighting Committee recommends that the following Staff Management Committee be appointed to carry out the ordinary managerial duties of Mr. A. J. FULLER, borough electrical engineer, whilst he is acting as joint consulting engineer in connection with the extension of the generating station under the South-East England Electricity Scheme, in the first instance for a period of 12 months, and that the members of the Committee be given extra remuneration as shown:—Mr. A. MURDOCH (power house engineer, chairman), £125 per annum; Mr. J. F. WHITE (mains superintendent), £100 per annum; Mr. N. A. CHESTERFIELD (commercial superintendent), £100 per annum); Mr. E. M. BROWN (chief clerk), £75 per annum.

Mr. C. L. FAUNTHORPE, for over 26 years mains assistant in the Blackburn Corporation Electricity Department, is retiring. After a short period in the South, Mr. Faunthorpe proposes to travel on the Continent. He was appointed mains assistant in the Croydon Corporation Electricity Department in 1900, and in 1903 was selected for a similar position at Blackburn.

The Blackburn Corporation Electricity Committee last Saturday selected Mr. W. ARDEN ROYLE, assistant engineer and manager to the Sunderland electricity undertaking, to succeed Mr. Wheelwright as chief engineer and manager.

Obituary.—Mr. A. A. DIRKS.—The *Industrial Australian* records that Mr. A. A. Dirks passed away in Sydney on September 1st. He joined the Commonwealth Postal Department as a cadet, and rose to the position of assistant electrical engineer. In 1906 he was sent to Western Australia as a special commissioner to inquire into the administration of the Engineers' branch of the G.P.O., and when its reorganisation was decided upon, he was appointed chief engineer for Western Australia. In 1911 he was appointed chief electrical engineer for Victoria, and there supervised the introduction of the automatic exchange at Geelong, the first of its kind in the Commonwealth. In 1916 he succeeded the late Mr. Nelson as chief electrical engineer of the Postal Department for New South Wales, which position he held till his retirement in 1918.

Mr. F. CALLENDER.—The death occurred on October 19th, at Worthing, after a long illness, of Mr. Frank Callender, brother of Sir T. O. Callender (Callender's Cable & Construction Co., Ltd.), and youngest son of the late William Ormiston Callender, of Bournemouth.

DR. F. W. O'CONNELL.—We regret to record that Dr. Frederick William O'Connell, D.Litt., Assistant Director of the Dublin Broadcasting Station, has died after being knocked down by a motor-omnibus.

Will.—The late SIR JOHN M. GATTI, a past-chairman of the London County Council, and managing director of the Charing Cross Electricity Supply Co., Ltd., left unsettled property valued at £265,689 gross and £254,988 net.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Acoustophone, Ltd.—Private company. Registered October 17th. Capital £1,000 in 500 10 per cent. cumulative participating preference and 500 ordinary shares of £1 each. Objects: To adopt an agreement with D. Douet, and to carry on the business of manufacturers, erectors, installers, maintainers and repairers of and dealers in all radio-gramophones, gramophone records, radio receivers, telegraphic apparatus, &c. The subscribers (each with one preference share) are: Major J. A. Stokes, 4, Whitehall Court, S.W.1.; A. Goodwin, 10, Norfolk Street, Strand, W.C.2, solicitor's manager. The first directors are to be appointed by the subscribers. Registered office: 82, Pelham Street, South Kensington, S.W.7.

Herd & Co., Ltd.—Private company. Registered October 18th. Capital £500 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, contractors, and merchants, manufacturers of and dealers in electrical, magnetic, telegraphic, telephonic and other appliances and apparatus, globes, shades, accumulators, meters, radio-telegraphs and telephones, &c. The directors are: J. G. Paris, 40, Falkner Square, Liverpool, fine art dealer; W. M. Herd, 8, Mellor Road, Prenton, Birkenhead, electrical engineer. Qualification: £1. Registered office: D2, Exchange Buildings, Liverpool.

Chorister Radio, Ltd.—Private company. Registered October 18th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and agents for and dealers in all kinds of radio goods, and in particular as manufacturers and sellers of "Chorister" radio products, &c. The first directors are: H. G. Furlong, 704, High Holborn, W.C.1, consulting engineer (chairman); W. H. Murad, 74, Lissenden Mansions, Highgate Road, N.W.5, engineer (managing director). The above are life directors. Secretary: H. E. Trottman-Botting. Registered office: 15, Queensway, Ponder's End, Middlesex.

Flexible Wires, Ltd.—Private company. Registered October 17th. Capital, £3,000 in £1 shares. Objects:—To acquire the business carried on by L. A. Gomersall at Astor House, Aldwych, W.C.2, and to carry on the business of dealers in electrical wire, switchgear and electrical appliances of all descriptions. The first directors are:—L. A. Gomersall, Oakshade, Somers Road, Reigate, electrical engineer (managing director); M. Kirkup, 22, St. Stephen's Road, Bayswater, W.2, merchant; E. C. Magnus, 147, Grosvenor Road, Highbury, N.5, electrical salesman. Qualification:—£100. Registered office, Astor House, Aldwych, W.C.2.

Leysian Electric Lamp Co., Ltd.—Private company. Registered October 17th. Capital £100 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers of electrical accessories, electrical and radio agents, &c. The first directors are D. Martin and A. Martin, 37, New Road, E.1. Secretary (pro tem), D. Martin. Registered office: Leysian Buildings, 114, City Road, E.C.

Guaranteed Accumulator Services, Ltd.—Private company. Registered October 18th. Capital £500 in £1 shares. Objects: To act as manufacturers, agents, and distributors of electrical accumulators, and mechanical, radio, musical apparatus and accessories, &c. The first directors are: A. B. Gates, 7, Station Road, Wealdstone, battery specialist; A. J. Scott-Dack, 17, Salisbury Road, Harrow, radio engineer; D. B. H. Robinson, 63, Barkstone Gardens, S.W.5, chemist. Registered office: 7, Station Road, Wealdstone.

Mason (Electro-Medical), Ltd.—Private company. Registered October 12th. Capital £2,000 in 1,900 shares of £1 each and 2,000 shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in electrical apparatus and appliances; to promote and encourage the study and investigation of electrical and electro-medical science, X-rays, &c. The first directors are: J. W. Mason, 53, Maybury Mansions, New Cavendish Street, W.1, ray therapy expert; Doris M. Mason, 53, Maybury Mansions, New Cavendish Street, W.1, nurse. Registered office: 96, Wigmore Street, W.1.

Graphones, Ltd.—Private Company. Registered October 14th. Capital £500 in £1 shares. Objects: To carry on the business of gramophone dealers, wireless, electrical lighting, telephone and general engineers and engineering contractors, consulting wireless experts, designers, manufacturers, factors, wholesale repairers and repairers of and dealers in radio and telephone apparatus and supplies of all kinds, &c. The subscribers (each with one share) are: L. C. Degassick, 327, Cowbridge Road, Cardiff, merchant; C. L. Thorn, 114, Malefant Street, Cardiff, accountant's clerk. The first directors are not named. Secretary (pro tem): C. L. Thorn. Registered office: 70, Cowbridge Road, Cardiff.

Hendon Lamp and Accessories Co., Ltd.—Private company. Registered October 14th. Capital, £1,000 in £1 shares. Objects:—To acquire the business of an electrical engineer and contractor and dealer in electrical accessories, appliances, and apparatus carried on by C. D. Falcke at 104, Southampton Row, W.C., as the Hendon Lamp and Accessories Co. The first directors are:—C. D. Falcke, Birchanger Cottage, Bishop's Stortford, electrical engineer; P. P. Fletcher, 12, Chester Terrace, Regent's Park, N.W.1, electrical engineer (both permanent, subject to each holding 190 ordinary shares). Registered office: 104, Southampton Row, W.C.

Dover Coal, Gas & Power Co., Ltd.—Private company. Registered October 17th. Capital £100 in £1 shares. Objects: To carry on the business of colliery proprietors, manufacturers and suppliers of electricity, gas, &c. The subscribers (each with one share) are: G. T Hannaford, Adelaide House, King William Street, E.C.2, chartered secretary; and F. D. Mottram, Briarbank, Hartley Down, Purley, secretary. The first directors are to be appointed by the subscribers. Qualification: One share. Secretary: C. W. Coote.

Moulding Developments, Ltd.—Private company. Registered October 14th. Capital, £1,000 in £1 shares. Objects:—To adopt an agreement with Speyer, Schwerdt & Co. (1929). Ltd., and to carry on the business of manufacturers, importers and exporters of, and dealers in insulators of all kinds, telegraphic, telephonic, electrical, mechanical, civil engineers, &c. The directors are:—E. A. L. Schwerdt (chairman), "Rosemead," Claygate, Surrey (director, Speyer, Schwerdt & Co. (1929), Ltd.); F. H. P. Watson, "Baal Bek," The Avenue, Church End, Finchley, N.3 (sales manager, Speyer, Schwerdt and Co. (1929), Ltd.). Registered office: 5 and 7, Golden Lane, E.C.1.

Radio Repairs, Ltd.—Private company. Registered October 9th. Capital, £700 in £1 shares. Objects: To carry on the business of consulting wireless experts, designers, and manufacturers of, agents for and dealers in radio, electrical and telephone appliances, &c. The permanent directors are: W. C. Adams (chairman), 5, Carshalton Grove, Sutton; W. S. Hawkins, Claremont, Carshalton Road, Sutton; K. B. Worker, 34, Montpelier Road, Sutton. Secretary: W. C. Adams. Registered office: 5, Carshalton Grove, Sutton, Surrey.

Official Returns of Electrical Companies.

Whitchurch and Pangbourne Electric Supply Co., Ltd.—Capital, £10,000 in 300 preference and 1,700 ordinary shares of £5 each. Return dated June 24th, 1929. 1,700 ordinary shares taken up. £8,500 paid. Mortgages and charges, nil.

Nathan & Allen, Ltd.—Capital, £10,000 in £1 shares. Return dated June 21st, 1929. 3,450 shares taken up. £1,100 paid. £2,350 considered as paid. Mortgages and charges, nil.

Dolywern and District Electricity Supply Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 18th, 1929. 625 shares taken up. £625 paid. Mortgages and charges, nil.

J. S. Ramsbottom & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 15th, 1929. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Midland Electric Corporation for Power Distribution, Ltd.—Capital, £1,000,000 in 200,000 preference and 800,000 ordinary shares of £1 each. Return dated April 9th, 1929. 200,000 preference and 700,000 ordinary shares taken up. £834,605 paid on 134,605 preference and 700,000 ordinary shares. £65,395 considered as paid on 65,395 preference shares. Mortgages and charges, nil.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in £5 shares. Return dated April 15th, 1929. 244 shares taken up. £1,220 paid. Mortgages and charges, nil.

Melton Mowbray Electric Light Co., Ltd.—Capital, £60,000 in £5 shares. Return dated May 3rd, 1929. 9,600 shares taken up. £48,000 paid. Mortgages and charges, £19,100.

Urban Electric Supply Co., Ltd.—Capital, £800,000 in £1 shares (444,975 ordinary, 350,000 preference, and 5,025 undenominated). Return dated May 23rd, 1929 (filed June 14th). 444,975 ordinary and 350,000 preference shares taken up. £490,000 paid on 240,000 ordinary and 250,000 preference shares. £304,975 considered as paid on 204,975 ordinary and 100,000 preference shares. Mortgages and charges: £498,008 (£350,000 5½ per cent. debenture stock and £148,008 4½ per cent. mortgage debenture stock).

Direct Spanish Telegraph Co., Ltd.—Capital, £95,000 in 6,000 preference and 13,000 ordinary shares of £5 each. Return dated May 1st, 1929. 12,931 ordinary and 6,000 preference shares taken up. £94,655 paid. Mortgages and charges, £96,000 4½ per cent. debentures.

Full Light Anti-Dazzle Lamp Co., Ltd.—P. Mordant, 115/117, Cannon Street, E.C., was appointed receiver and manager on October 7th, under powers contained in second debenture dated September 28th, 1929.

Reproduction, Ltd.—Particulars filed of £7,000 debentures authorised July 16th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being issued on September 30th, 1929.

Julians of Reading, Ltd.—Charge on certain land and premises in Reading, dated October 1st, 1929, to secure £3,650 and further advances up to a maximum of £6,000. Holder: H. Julian, "The Hermitage," Basingstoke.

Richmond (Surrey) Electric Light & Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated May 17th, 1929. All shares taken up. £200,000 paid. Mortgages and charges, nil.

Tre-Coil Works, Ltd.—J. E. Costello, C.A., 90, Cannon Street, E.C., was appointed receiver on October 2nd, under powers contained in debenture dated February 4th, 1929.

Kingsmill Art Metal & Electrical Co., Ltd.—W. H. Dunn, 57, Lodge Road, West Croydon, ceased to act as receiver or manager on September 24th, 1929.

Accumulators of Woking, Ltd. (old company).—H. T. Witt, 5, Chancery Lane, W.C.2, ceased to act as receiver and manager on October 4th, 1929.

Bowyer-Lowe Co., Ltd.—Satisfaction in full on January 26th, 1929, of charge dated November 10th, 1928, securing all moneys. (Notice filed October 10th.)

Boroughbridge & District Electric Supply Co., Ltd.—Particulars filed of £3,000 debentures, authorised by resolutions of July 16th and October 2nd, 1929, charged on the company's property, including uncalled capital, the whole amount being now issued.

Torquay Tramways Co., Ltd.—Satisfaction to the extent of £1,600 on September 11th, 1929, of charge dated March 8th, 1911, securing £60,000.

Improved Wilson Microphone & Electrical Co., Ltd.—Particulars filed of £75 debentures authorised September 16th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Dorian Wireless Co., Ltd.—Satisfaction in full on October 1st of debenture dated August 16th, 1929, securing £2,100.

Tamplin & Makovski Ltd.—Particulars filed of £13,264 debentures authorised by resolutions of August 23rd and September 18th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

St. Helens Cable and Rubber Co., Ltd.—Capital, £100,000 in £1 shares. Return dated August 5th, 1929. 84,000 shares taken up. £84,000 paid. Mortgages and charges, nil.

Thompson, Ritchie & Co., Ltd.—Issue on September 25th, 1929, of £800 debentures, part of a series already registered.

Merthyr Electric Traction & Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5 each. Return dated May 28th, 1929. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges: £48,400.

A. Hirst & Son, Ltd.—Capital, £20,000 in 100 preference and 1,900 ordinary shares of £10 each. Return dated May 30th, 1929. 100 preference and 1,220 ordinary shares taken up. £2,200 paid on 100 preference and 120 ordinary shares. £11,000 considered as paid on 1,100 ordinary shares. Mortgages and charges, nil.

Sea Houses & District Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated May 9th, 1929. 2,910 shares taken up. £2,910 paid. Mortgages and charges: £280 1s. 11d. A return of allotments made up to May 24th, 1929, shows a further 100 ordinary shares allotted, payable in cash, and fully called up.

G. W., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1928 (filed September 11th, 1929). 102 shares taken up. £102 paid. Mortgages and charges, nil.

Coley & Swinnerton, Ltd.—Capital, £2,000 in £1 shares. Return dated June 7th, 1929. 1,101 shares taken up. £1,101 paid. Mortgages and charges, nil.

Minehead Electric Supply Co., Ltd.—Capital, £50,000 in 16,000 first preference, 8,000 second preference, and 26,000 ordinary shares of £1 each. Return dated June 20th, 1929. 15,913 first preference, 7,192 second preference, and 9,865 ordinary shares taken up. £29,974 10s. paid (being £1 per share on 7,892 ordinary, 13,122 first preference, and 5,893 second preference, and 15s. per share on 2,791 first preference and 1,299 second preference shares). £1,973 considered as paid on 1,973 ordinary shares. Mortgages and charges: £20,000. A return of allotments made up to June 28th, 1929, shows a further 5,135 ordinary and 883 second preference shares allotted, payable in cash, and fully called up.

Lewes & District Electric Supply Co., Ltd.—Capital, £50,000 in 2,500 preference and 2,500 ordinary shares of £10 each. Return dated May 28th, 1929. 2,327 ordinary shares taken up. £23,270 paid. Mortgages and charges: £20,000.

West London & Provincial Electric & General Trust, Ltd.—Capital stock, £390,000 in £192,000 5 per cent. preference stock and £198,000 ordinary stock. Return dated May 10th, 1929. £192,000 preference and £198,000 ordinary stock issued. £264,000 paid. £126,000 considered as paid. Mortgages and charges, nil.

Atmos Electrical Co., Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1 each. Return dated March 9th (filed August 29th), 1929. 750 ordinary shares taken up. £750 paid. Mortgages and charges, nil.

City Notes.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted :—

Power Corporation of Canada, Ltd.—31,826 shares of common stock of no par value.

Underground Electric Railways Co. of London, Ltd.—8,188 ordinary shares of £1 each, fully paid, Nos. 7,234,763 to 7,242,950.

Dealings in the following have been allowed by the Committee under Rule 159 :—

American Telephone & Telegraph Co.—$3,155,000 capital stock in shares of $100 each.

Aron Electricity Meter, Ltd.—£103,332 income debenture stock (6 per cent. participating).

Underground Electric Railways Company of London, Ltd.—6,741 ordinary shares of £1 each, fully paid, Nos. 7,242,951 to 7,249,691.

Application has been made to the Committee to allow the following to be officially quoted :—

American Telephone & Telegraph Co.—$3,155,000 capital stock.

Crompton Parkinson, Ltd.—400,000 ordinary shares of 5s. each, fully paid, Nos. 50,001 to 450,000.

Drake & Gorham, Ltd.

The directors' report for the year ended June 30th last records a net profit of £8,220, as compared with £9,628 in the preceding year. The addition of £3,570 brought forward makes available £11,790. The dividend is maintained at 5 per cent., and £2,500 (the same) is placed to reserve, leaving £3,040 to be carried forward. Reference is made to the death, in January last, of Mr. J. M. Gorham. It is stated that in spite of the continuance of abnormal taxation and consequent trade depression, which are responsible for the somewhat reduced profits, the recent developments have resulted in a rapidly increasing turnover. The demand for the company's h.p. switchgear necessitates the acquisition of larger works, the financing of which is now under consideration. The company has received contracts for the electrical equipment of many large buildings, including the new head offices of Martin's Bank, Harrod's extensions, the Junior Carlton Club, and Bedford College. The meeting is to be held on Tuesday next.

Herbert Morris, Ltd.

The net profit for the year ended July 31st last rose from £95,022 to £95,415. To this are added interest from investments, &c., and £52,952 brought forward, making £159,017. After meeting the preference dividend, &c., it is proposed to pay a final ordinary dividend, making 15 per cent. for the year, free of tax (as for 1927-28), to place £25,000 to reserve, and to carry forward £51,605. Meeting : To-day (Friday).

Atlas Light and Power Co., Ltd.

The declaration of a final dividend of 3 per cent. on the old ordinary shares brings the year's distribution up to 5 per cent., the same rate as for 1927-28.

Erinoid, Ltd.

The directors have declared a final dividend of 4½ per cent. for the year ended August 31st last, making 7 per cent. for the year. Last year's dividend was at the same rate.

Hoffman Manufacturing Co., Ltd.

An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares, as last year.

Calcutta Electric Supply Corporation, Ltd.

The directors have declared an interim dividend of 5 per cent. for the half-year ended June 30th, on the ordinary shares.

Anglo-Portuguese Telephone Co., Ltd.

An interim dividend of 3 per cent. has been declared, as last year.

River Plate Electricity Co., Ltd.

The interim dividend on the ordinary stock is 3 per cent., as last year.

Isle of Wight Electric Light and Power Co., Ltd.

The interim ordinary dividend is again at the rate of 8 per cent. per annum, free of tax.

Shanghai Electric Construction Co., Ltd.

The interim dividend is again 5 per cent., free of tax.

French Companies.

The *Société La Radio Industrie* records net profits of 472,000 fr. for 1928-29; a dividend of 5 per cent. is paid on the preference shares.

The *Société d'Applications Industrielles* (*Compagnie d'Entreprises Electriques*) realised net profits of 7,119,000 fr. in 1928-29: the dividend is maintained at 17 per cent. on capital, increased from 30 to 40 million fr.

Stocks and Shares.

Tuesday Evening.

The outstanding feature in the Stock Exchange markets is the break that has occurred in shares of the American utility companies, many of which have recently been raised to record levels. To justify these prices it became necessary for the buyers to fall back upon the argument that Americans were no longer putting money into stocks and shares for the purpose of securing immediate income, but rather with the deliberate intention of disregarding present-day conditions, and looking to the future to provide such an increase of earning capacity as would be reflected in the price of the shares. Put more briefly, the Americans were deemed to be buying on the hope of capital appreciation, and not on the older-fashioned idea of getting good dividends right now. The difference between the British and the American angle was mentioned here in the issue of October 4th. It was then pointed out that the American investor insisted, according to Stock Exchange theorists, upon the profit-earning capacity of a company, instead of upon the current dividend distributions.

Severity of the Slump.

The former theory has been flung violently overboard in a slump during which American speculators have been unloading as quickly as possible. What brought the matter to a head it is difficult to say, because the monetary position in New York is a good deal easier than it has been for some time past. The fact remains, however, that dramatic falls have taken place. To take a few instances, Electric Bond and Share common have come down, since the third week in September, some 63 points. American Light & Power shares within the same period are more than 50 points down. General Electrics dropped 36, American Telephones 22½, Pacific Gas and Electric 32, American Gas & Electric 56. One might go on extending this lugubrious list by way of illustrating the severity of the fall, but there is little use in labouring an argument which has made its effect felt in wide directions. Shares in the companies that are familiar on this side have suffered with the rest, though not, in many cases, to the same extent. Even at the present reduced figures, the returns on the money employed in the purchase of such shares are extremely meagre, and, after the fall, several of the best-known shares still stand at prices at which the yield on the money is 3 per cent. or less.

Stock Exchange Price-Sympathy.

The slump in New York has come at a very unfortunate time for British securities, the quotations for which are already disposed to depression by reason of the many disturbing factors that prevail throughout the world. There is an over-production in so many different things at the present time; tea, for instance, rubber, oil, tin, coffee, &c. The piling-up of stocks in various commodities and metals has the effect of absorbing a good deal of money for its financing, with the result that capital is locked up at a time when it could be usefully employed in circulation. The Stock Exchange settlement in the Hatry group of stocks and shares has yet to take place, and, until this is out of the way, markets are bound to be nervous and apprehensive. Evidence is afforded that the public do not realise the close sympathy that exists between one Stock Exchange market and another.

Strength of Sound Stocks.

This sympathy is due to the fact that the man who is speculating usually has interests in a variety of markets. If his commitments become embarrassing in one direction, he has to sell, also, other things that he has open at the same time, besides stocks and shares taken up as permanent investments. Many holders of stocks and shares are exasperated at the manner in which prices fall in the securities of companies that, to all outward appearance, have no connection whatever with any of the various reasons for trouble that prevail. But experience knows only too well that a sharp fall in any particular group of stocks and shares produces an influence that is felt far beyond its immediate range. The important advances that have occurred this week in the market for British Government and gilt-edged securities are indicative of the scare which capital has had in connection with speculative risks. A generally better tone made itself felt this, Tuesday, afternoon in a number of markets.

Electricity Supply.

County of London ordinary gave way to 52s. 6d. Isle of Thanet ordinary are a florin lower, at 38s. Bournemouth and Poole were rather pressed for sale. A slight decline took Midland Counties to 33s., and Scottish Power drooped to 30s. 6d., the new shares being 6d. premium. Northamptons, at 51s. 9d., are within a few pence of the price to which they improved last week.

Dollar Stocks.

This time last week Hydro-Electrics were 71¼. The price rallied to 73, and then fell, with brief spasms of resistance, to 57, recovering to 60, which left it 11¼ down. International Holdings dropped to 7¼, then rose to 8½. Around Brazilian Tractions, bulls and bears fought pitched battles. The bears

won easily, and at 67 the ordinary shares are 5½ lower; the preferred, at 225, are 15 down. Montreal Light & Power fell 3, to 167½; Pennsylvania Water 3½, to 97½; Power Corporation of Canada 6½, to 113½. The Powell River Company, of Vancouver, contemplates an expenditure of six to eight million dollars upon a first unit of an electric power plant, and on the installation of another paper-making machine. It is stated, furthermore, that the British Columbia Electric Railway intends to spread over six years the investment of fifty million dollars in British Columbia, in order to obtain increased power. This contains a hint of possible new issues in days to come.

Mexicans are flat. The Light & Power common have shed 14, dropping back to 96. Mexico Tramways are 8½ lower, at 45½. The prior-charge issues have not suffered to any noticeable extent. Pueblas are easier at 18, on the figures given here last week. Pachuca 5 per cent. bonds went back to 68½.

Atlas Light and Power.

American Telephone & Telegraph shares are 20 lower, at 290. International Telephone & Telegraph, at 120, are 15 down. Atlas Light & Power gave way to 24s. 6d. on the declaration of a final dividend of 3 per cent, making 5 per cent. for the year ended March 31st last. This is the same as the dividend for the previous year. The price recovered to 26s. 6d. on bear closing. The company's new ordinary and preference shares, offered last November, rank for dividend in the year now current. It will be remembered that the Atlas Light & Power sold part of its electric supply and traction interests to the American & Foreign Power Company, for 8½ million pounds sterling. In the British group, Automatic Telephones are unchanged at 37s. 6d., and International Automatics at 33s. 9d. Telephone Manufacturing are quoted at 3s. 3d.

Cables—and Australians.

Cables & Wireless "B" ordinary stock has been down to nearly 50; it rallied to 52½, leaving a fall of 5 points. The 7½ per cent "A" ordinary is lower, at 84, but the 5½ per cent. preference has held its previous advance to 96, in sympathy with the strength of gilt-edged stocks. Australian loans, of which some were issued partly in connection with electrical schemes, are heavy, by reason of the success of the Labour Party in last week's Elections. Prices of Australian stocks and shares are nearly all easier, on political apprehensions. Of the electric lighting and power issues, Melbourne Electric consolidated ordinary stock is 177 and the 8 per cent. preference shares of £5 each are 5⅞. Adelaide Electric 6 per cent. first preference keep at 21s. 6d. The 5 per cent. A preference (upon which the dividend is paid free of tax), and the 6½ per cent. preference shares are also about the same price, 21s. 6d. In the wireless shares, Marconi Marines further receded to 2⅞, because of the reduction in the interim dividend. Baird Televisions are 6s.

Home Railways.

The Home Railway market has succeeded in standing up fairly well to the depressing conditions opposed to it, but, in spite of this, Underground Electric income bonds are 3 points down at 105, and the price of the £1 shares has weakened to 22s. Metropolitans and Districts both hold their rises of a week ago, and the market is not bad as a whole, with noticeable demand for the prior-charge stocks, of which there is none too much supply available at the present time. The various tramway and transport issues connected with London and the provinces are so neglected that their prices show no movement at all on the week. British Electric Traction holds its high level at 1,600. Shares in motor companies have given way by reason of the impression that has got round to the effect that less business is being done at the Olympia Show than anticipation had looked for in advance.

Manufacturing Companies' Shares.

The effect of the general slump upon shares in manufacturing companies is seen more particularly in Associated Electrical Industries ordinary. On heavy selling from America, the price fell from 37s. 6d. to 30s., there being little inclination on this side to support the price. General Electrics have fallen 5s. to 2⅜, the selling in this case also coming from New York. The preference shares show steadiness, and are unaffected by the fall in the ordinary. Henley's are ¼ down at 6 7/16, but no changes have occurred in Enfields at 5, British Insulated at 4½, Callender's at 4. Siemens have gone back to 27s. 6d. The 10 per cent. preference shares at 32s. 9d. hold their price well. No alteration has occurred in Johnson & Phillips at £2. India-Rubber shares weakened to 11s. 3d., English Electrics to 7s. 6d.

While the iron and steel market is dull, no particular changes of consequence have occurred. Vickers have been a shade below their present price of 8s. 4½d. The iron and steel group as a whole is disposed to be heavy. Among rubber shares, the tendency is also dull, owing to the inability of the price of the produce to make any upward headway against the over-production that continues to be noticeable in the weekly figures.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1927.	1928.	Price Oct. 22 1929.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	63/3	—	4 15 0
Brompton Ordinary	1	8½	8½	26/-	—	5 7 8
Charing Cross Ordinary	1	8½	8½	26/6	—	5 5 8
do. do. 4½% Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8¾	8¾	25/-	—	5 12 0
City of London	1	10	10	39/-	—	4 7 6
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	40/-	+½	... ...
County of London	1	7	10	52/6	−1/6	3 16 4
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref.	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	1	11	11	52/-	—	4 4 8
Kensington Ordinary	1	8	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	28/-	—	5 7 2
London Electric	1	8½	9	27/6	—	5 1 10
Metropolitan	1	9	9	46/3	—	3 17 3
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	6½	33/-	−6d.	3 18 9
Mid. Elec. Power	1	15	8	34/6	—	4 12 9
Newcastle-on-Tyne Ordinary ...	1	6	6	26/3	—	4 11 5
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	21/6	—	5 11 8
St. James' and Pall Mall	1	8	8	26/6	—	5 5 8
Scottish Power	1	8	8	30/6	−6d.	5 4 3
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	38/3	—	3 13 6
Westminster Ordinary	1	8½	8½	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8		35/6	—	4 10 0

Home Rails.

Central London Ord. Assented ...	Stock	4	4	71	—	5 12 8
Metropolitan	„	8	8½	62	—	5 13 0
do. District	„	4	5	73	—	6 17 0
Underground Electric	£1	5	7	22/-	−6d.	6 7 3
do. do. Income ...	Bonds	6	6	105	−3	5 14 3

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	98½	—	5 1 10
do. Def.	„	1½	1½	24⅜	—	6 4 6
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½ Pref.	Stock	—	—	96	—	5 14 7
do. A 7½ Ord.	„	—	—	84	−1	... ...
do. B Ord.	„	—	—	52½	−5	... ...
Globe Tel. and T. Ord.	10	10	10	23½	−10/-	*4 5 1
do. do. Pref.	10	6	6	10⅜	—	5 9 1
Great Northern Tel.	10	20	17½	30	−½	5 16 9
Indo-European	25	10	10	47½	—	*5 5 3
Marconi-Marine	1	12½	15	2⅜	−⅛	... ...
Oriental Telephone Ord	1	12	12	2 15/16	—	... ...

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8 1/16	—	8 19 6
do. do. 2nd Pref. ...	5	6	6	8 1/16	—	9 16 0
do. do. 5% Deb. ...	Stock	5	5	75	—	6 13 4
British Electric Traction Def. Ord.	„	5	5	1600	—	... ...
do. do. Pref. Ord.	„	8	8	124½	—	6 8 6
Brazil Traction	100	7	8	67	−5½	2 19 8
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	£6½	—	5 15 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	51½	—	7 15 4
Mexico Trams. 5% Bonds	—	5	5	73½	−3	6 18 0
Mexican Light Common	100	Nil	Nil	96	−14	... ...
do. 7% Pref.	100	7	7	80½	—	8 3 8
do. 1st Bonds	—	5	5	78	—	6 12 5
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	—	30/-	−⅜	4 0 0
Babcock & Wilcox	1	13	15	62/6	—	*4 16 0
British Aluminium Ord.	1	10	10	47/6	−½	*4 4 5
British Elec. Transformer Pref. ...	1	7	7	13/-	—	... ...
British Insulated Ord.	1	15	15	4½	—	3 12 10
Brush Ord.	Stock	10	10	130	—	7 13 10
Callenders	1	15	15	4	—	3 15 0
do. 6½% Pref.	1	6½	6½	1½	—	5 4 0
Crompton Parkinson Ord.	5/-	—	30	21/3	−1/6	7 1 6
do. 8% Pref.	1	8	8	25/-	—	6 8 0
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	7 1 9
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	5½	15/-	—	7 6 8
Enfield Cable Ord.	1	20	20	5	—	4 0 0
English Electric	1	Nil	Nil	7/6	−9d.	... ...
do. do. Pref.	1	8	Nil	8/9	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	10	10	23⅜	−⅛	4 4 9
Henley	1	25	30	6 1/16	−¼	4 16 4
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	11/3	−1/16	... ...
Johnson & Phillips	1	10	—	2	—	5 0 0
Siemens Ord.	1	7½	7½	27/6	−1/16	5 9 1
Telegraph Construction	12	10	10	23	—	5 4 9

* Dividends paid free of Income Tax.

Our Foreign Electrical Trade.

Electrical Exports and Imports during September.

THE Board of Trade returns of our overseas electrical trade during last month are very disappointing. While the exports reached the lowest level since June, 1926, the imports were higher than ever before.

Comparing the exports with those of the previous month there was a decline of £348,215. The telegraph and telephone section was responsible for £147,095 of this and the machinery class for a further £82,868. In the section covering goods and apparatus the largest decrease was shown against unenumerated goods, while there were also considerable declines in insulated wires and cables and glow lamps. The only increase of any size occurred in the case of "other" motors and generators. When compared with September, 1928, the position appears in a more favourable light. The decline in the total amounted to only £148,038, and this was due solely to the large slump in exports of submarine telegraph and telephone cable, an item which we have frequently pointed out as subject to violent fluctuations. Apart from this the only decrease of any size was that of £11,109 in the case of traction motors. There were several large advances such as those in the case of telegraph and telephone instruments and apparatus (£38,546), "other" motors and generators (£34,653), and insulated wires and cables (£33,682).

The imports were not substantially higher than in August; there were, however, a number of large increases and decreases. The former included £26,771 in the case of batteries and accumulators, £21,746 for telegraph and telephone apparatus, and £18,986 for meters and instruments. There was a fall of some magnitude (£39,804) in machinery imports, while glow lamps also experienced a large decline. As compared with September, 1928, the rise in the total was considerable (£303,613) and general. The bulk of the advance (£146,497) was attributable to telegraph and telephone apparatus, but substantial contributions were made by unenumerated goods (£53,609), unenumerated machinery (£40,218), insulated wires and cables (£30,863) and meters and instruments (£20,371). There were only three decreases and these were comparatively unimportant.

Our figures show that while British electrical exports in the first nine months of the year rose by £366,732 or 2.7 per cent. as compared with the corresponding period of 1928, the imports increased by £1,076,980 or 23.9 per cent.

The following table shows the distribution of our September exports of electrical machinery:—

Destination.	Sept., 1928.	Sept., 1929.	Inc. or dec.
	£	£	£
European countries	120,185	92,093	– 28,092
Japan	2,655	8,072	+ 5,417
South America ...	33,011	41,252	+ 8,241
South Africa ...	22,342	36,876	+ 14,534
British India ...	74,967	80,211	+ 5,244
Australia	59,958	59,937	– 21
New Zealand ...	18,116	13,468	– 4,648
Canada	13,099	24,423	+ 11,324
Other countries ...	54,691	76,216	+ 21,525
Totals	£399,024	£432,548	+£33,524

The figures show that Empire countries took about half of the exports in each month. Although the share of European countries decreased substantially their purchases for the first nine months of this year were well above those for the corresponding period of 1928, in spite of a decrease in the total for the nine months from £4,977,736 to £4,694,347.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Sept., 1929.	Inc. or dec. as compared with Aug., 1929.	Inc. or dec. as compared with Sept., 1928.	Electrical imports for Sept., 1929.	Inc. or dec. as compared with Aug., 1929.	Inc. or dec. as compared with Sept., 1928.	Electrical re-exports for Sept., 1929.	Inc. or dec. as compared with Aug., 1929.	Inc. or dec. as compared with Sept., 1928.
Electrical goods and apparatus (unenumerated)	£215,252 –	£49,651 +	£30,281	£176,441 +	£15,617 +	£53,609	£11,161 +	£959 +	£4,745
Insulated wires and cables ...	241,085 –	29,651 +	33,682	82,130 +	9,860 +	30,863	1,127 +	391 –	1,007
Glow lamps	39,380 –	27,064 –	2,801	34,685 –	19,943 +	403	963 +	731 –	116
Arc lamps and parts ...	1,315 +	708 +	813	1,073 –	417 –	1,551	89 +	69 +	84
Batteries and accumulators ...	86,371 –	1,030 +	17,936	96,270 +	26,771 +	17,793	653 –	2,374 +	154
Meters and instruments ...	25,521 –	8,695 +	7,734	40,234 +	18,986 +	20,371	694 –	17 –	531
Carbons	1,942 +	1,056 –	757	7,684 –	61 –	1,952	128 –	79 +	98
Switchboards (not telegraph or telephone)	2,989 –	3,925 +	113	139 +	139 +	127	— –	15 –	
Electrical Machinery—									
Electrical machinery (unenumerated)	245,431 –	90,575 +	9,980	137,867 –	39,804 +	40,218	9,153 +	1,843 –	1,925
Railway and tramway motors	17,041 –	694 –	11,109	—	—	—	—	—	—
Other motors and generators...	170,076 +	8,401 +	34,653	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	71,489 –	15,438 +	20,337	4,012 +	1,751 –	2,765	— –	2,040 –	384
Submarine telegraph and telephone cable	45,612 –	49,054 –	327,446	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	167,027 –	82,603 +	38,546	202,396 +	21,746 +	146,497	2,819 –	2,946 –	226
Totals	£1,330,540	–£348,215	– £148,038	£782,931 +	£34,645 +	£303,613	£26,787 –	£3,478 +	£892
	Exports			Imports			Re-Exports		
Inc. for nine months	+£366,732			+£1,076,980			+ £12,852		

Industrial Conditions in Germany.

A Review of the 1928-29 Period.

THE Department of Overseas Trade has recently issued the customary report on "Economic and Financial Conditions in Germany," by Mr. J. W. F. Thelwall, M.C., commercial counsellor, and Mr. C. J. Kavanagh, commercial secretary, Berlin.* The report seems to occupy more pages than usual, is more up-to-date and forms a valuable record of the situation in Germany in 1928 down to about the end of May last, or even later in a few particulars.

The report opens with the statement that the sixteen months ended with April, 1929, represented an ebb in the German economic situation, which was at first gradual. The slowing down of the pace of industrial activity is ascribed to four factors. These are the completion of the large-scale re-equipment and technical rationalisation of industries, the reversal of the American money market which attracted money instead of distributing it, the revival of the reparations question, and the interference with many of the producing industries by the long and severe winter. The effect on industry of the general and financial conditions did not make itself felt as much as might have been expected, at least in the case of production. It is true that many industries experienced a falling tendency in the production, but this is considered to be hardly more than can be accounted for by seasonal influences or labour troubles, and in most cases a revival was noticeable in the early part of 1929.

Industrial Prosperity.

Although slightly less pit coal was produced in 1928, if lignite is also taken into consideration, it is found that the total quantity raised was greater, and the consumption of solid fuel rose by 3,750,000 metric tons over the previous year. In a similar manner the consumption of electrical energy increased from 25,100,000,000 kWh in 1927 to 29,000,000,000 kWh last year. During the course of 1929 the production of pit coal has shown a large increase over that for the corresponding period of last year.

In the case of the engineering industry, the report says that 1928 was a better year than its predecessor. The value of the output is estimated at 4,000,000,000 marks as compared with 3,400,000,000 marks in the previous year. The improvement was due to the large deliveries of electric power equipment and to good export orders, and like many other branches this industry benefited considerably through deliveries on reparation account. The makers of machine tools and textile machines were able to counteract the decline in the home market by larger sales to other countries.

On the whole, the iron and steel industries may be considered to have successfully overcome a critical period, and the situation was regarded sufficiently favourable for an increase in the prices of pig iron in May, 1929. During the current year the production of iron and steel has considerably improved over the corresponding period of last year. Shipbuilding, too, has to be included among those branches which were better occupied in 1928, despite a strike extending over three months. The tonnage of ships completed was 38,000 greater than in 1927; foreign orders increased, and a number of these were for reparation account. Moreover, a remarkable degree of expansion took place in the motor vehicle industry.

Import and Export Trade.

Coming to the foreign trade of Germany last year, it is noted that the general conditions are very strongly and rapidly reflected in the foreign commerce. The moment a little weakness is manifested, in the home market, the imports begin to decline, and they dropped by £11,650,000 on the year, whereas the exports last year exhibited the remarkable increase of £70,856,000. The development this year has continued favourable, the imports in the first four months having been below the monthly average in 1928, and the exports higher per month. In connection with this situation, the fact is recalled that while the sale prices of products controlled by syndicates and cartels experienced an increase last year, those of goods not under the regulation of any such organisation decreased. During the period under review, wages continued to rise and the working hours to diminish. The annual census made by the trade unions shows that of the 3,000,000 workers taken into consideration, 62 per cent. work 48 hours, or less, per week, and 23 per cent. from 48 to 54 hours.

In this connection particular interest may be attached to the question of the interchange of trade between Germany and England, showing as it does a balance in favour of the former. According to a tabular statement of trade by countries, the value of the exports from Great Britain and Northern Ireland to Germany declined from 963,066,000 marks in 1927, to 893,165,000 marks last year, whereas German exports to Great Britain and Northern Ireland rose from 1,117,517,000 marks to 1,182,386,000 marks in the two years, respectively, showing a balance in favour of Germany of £10,722,000 in the first year, and one of £14,461,000 in the second. Most of the British exports to Germany consist of raw and semi-finished materials, whereas the German exports to Great Britain comprise a wide range of manufactures. Thus the exports of machine tools in 1928 were of the value of 10,455,000 marks, and represented a quantity of 5,374 metric tons, these comparing with 10,363,000 marks and 6,034 metric tons in 1927. In the case of electrical products, the German exports to Great Britain were valued at 29,925,000 marks (8,762 metric tons) in 1928, as compared with 28,048,000 marks (8,975 tons) in 1927.

The Electrical Manufacturing Industry.

Concerning this branch, the report states that the electro-technical industry was well occupied last year, and it was again able to obtain a considerable increase in the export trade, the value of which advanced from 441,000,000 marks in 1927 to 536,000,000 marks last year. The increase in 1928 over 1927 was 24.3 per cent. in the exports to European countries, which absorbed products of the value of 419.9 million marks, 15.1 per cent. in the case of South America (49.6 million marks) and 19.2 per cent. in that of Asia (40.3 million marks).

A particularly prominent part in the larger exports last year was occupied by central station plant, dynamos and transformers, which increased by 31 per cent. over 1927; electric lamp exports rose by 30 per cent., telephone and telegraph equipment by 27 per cent., heating and cooking appliances by 33 per cent., and electro-medical appliances by 23 per cent. Radio apparatus, cables and measuring instruments, although showing an improvement over 1927, participated in a less marked degree in the general increase. On the other hand, galvanic and dry battery exports declined by 6 per cent., and porcelain insulators by 11 per cent., while accumulators remained stationary. The appended table gives a comparison of the principal exports in the two years, an all-round improvement of some 21.5 per cent. having taken place:—

German Exports of Electro-Technical Products.

Description of product.	1927 Tons.	1927 Value in 1,000 Mks.	1928 Tons.	1928 Value in 1,000 Mks.
Lighting sets and starters for motor cars	503.4	5,710	690.4	6,942
Dynamos, electric motors, and transformers—				
(*a*) Up to 10 kg. ...	662.5	4,967	751.5	6,129
(*b*) 10 kg. to 25 kg. ...	595.5	2,591	692.4	3.316
(*c*) 25 kg. to 150 kg. ...	3,689.4	10,319	4,512.4	13,134
(*d*) 150 kg. to 500 kg. ...	3,537.1	9,130	4,345.4	12,870
(*e*) 500 kg. to 3,000 kg.	7,912.5	17,707	7,865.3	17,698
(*f*) Over 3,000 kg. ...	8,620.6	15,070	11,901.0	21,249
Armatures and commutators	1,538.7	6,650	2,618.2	9,338
Metal-filament lamps ...	1,025.7	25,898	1,296.4	33,861
Telephone apparatus ...	—	21,825	—	27,498
Radio apparatus	3,541.2	41,983	4,279.6	49,348
Electrical meters and measuring apparatus ...	2,821.0	32,936	2,923.5	37,597
Magneto ignition apparatus (excluding magnetos) & other ignition apparatus, electro-technical appliances for motor cars	1,352.5	16,874	1,874.6	20,101
Apparatus for electric lighting, power transmission, electrolysis, etc.	24,239.4	85,381	31,208.9	111,877
Galvanic elements, batteries, etc.	6,373.4	13,093	6,084.1	12,340
Cable, underground or marine	42,595.6	40,662	49,039.5	47,127

According to the report, the chief markets for the smaller dynamos, in the order of their importance, were: Sweden, Holland, Denmark, Great Britain, Switzerland, Czecho-Slovakia, and Austria, while Russia remained by far the most important market for the larger types, as well as for commutators. In the case of radio apparatus one-fourth of the total exports is stated to have been purchased by Great Britain.

Concerning the German home trade, the report merely mentions that the inland market continued to be influenced by the large amount of work put in hand for the public utility companies, and the chief firms appear to have been well employed on large steam turbine sets, but business in the medium sizes was not so well maintained. The work avail-

* Stationery Office, 3s. 6d. net.

able in telephone cables for the Post Office diminished somewhat, but the supply companies were able to place a good deal of work for sub-station switchgear.

It is stated that the A.E.G. and Siemens and Halske have embarked on the manufacture of projection apparatus for sound films, and it is reported that a considerable number of these have already been sent to Great Britain.

Electricity Production.

During 1928 both electrical firms and producers and distributors of electricity made extensive use of the foreign capital market to satisfy their need of extension and development. Electricity supply concerns alone raised about 360 million marks of foreign money, the figure rising to 500 millions, if electric railways and electrical manufacturers are added, this aggregate excluding shares sold abroad. Various extensions were put in hand or are contemplated by the supply works owned by the Reich and Prussia and the Westphalian Electricity Company, and of these some details are given in the report.

The census of the production of electricity has now been brought up to the end of 1927. In 1925 the output was stated to be 20,300,000,000 kWh; in 1926 it increased to 21,200,000,000 kWh, and in 1927 to 25,100,000,000 kWh, while the estimate for 1928 is 29,000,000,000 kWh. The quantities in 1927 were generated by 7,414 works, of which 1,399 were public stations with an output of 12,300,000,000 kWh, and 6,015 were private plants with an output of 12,800,000,000 kWh. Pit coal formed the fuel basis of 36 per cent. of the energy produced, and lignite 34.2 per cent. The use of water power experienced a slight decrease; it amounted to 15 per cent. in 1927, as against 16 per cent. in 1926, and 14 per cent. in 1925. The share of gas also declined from 11.2 per cent. in 1926 to 10.7 per cent. in 1927.

As to the conversion of railways to electric traction, the report merely mentions that the length of track which was newly electrified in 1928 amounted to 284 km., thus bringing the total length of main lines thus operated to 1,287 km., and of town and suburban lines to 225 km. New lines of a length of 217 km. were brought into service last year.

In conclusion, the report refers briefly to the posts and telegraphs, and enumerates the developments in wireless transmission between Germany and foreign countries which took place in 1928.

The Engineering Industry.

Approaching the section of the report which deals with the metallurgical and engineering industries, Mr. Kavanagh states that the latter were considerably better provided with work than in the preceding year, and the value of the production rose from 3,400,000,000 marks in 1927 to 4,000,000,000 marks last year. The activity in electric power equipment, the modernisation and extension of plant which was undertaken in the coal-mining industry, in coke oven batteries, and in the steel works plant so as to rationalise the basic industries, provided fairly satisfactory business in the home market, although a large part of the programme was nearly completed, and there has been a gradual decline in orders since the middle of last year.

The export markets were energetically cultivated, and the measure of success is evidenced by the foreign trade statistics. In this respect it is shown that the exports of machinery increased from 458,438 metric tons in 1927 to 538,026 tons last year, while the value rose from 870,218,000 marks to 1,061,387,000 marks. The opinion is expressed that exports were undoubtedly assisted to some extent by the system of "export bounties," whereby machine builders are able to buy from the steel syndicates, at the world-market prices prevailing at the time, steel products for conversion into export machines, and do not have to pay the home prices charged for the same materials for manufactures for the inland market.

Indian Electrical Notes.

From Our Indian Correspondent.

Proposed Calcutta Tube Railway.

As has already been reported, a large electric tube railway for Calcutta is proposed, and investigations have been recently completed by Mr. C. H. Lydall on behalf of the consulting engineers, Messrs. Merz & Partners. The scheme is roughly estimated to cost about £4,000,000, and is put forward in connection with the project for electrifying the suburban lines of the East Indian Railway and the Eastern Bengal Railway. The recommendations envisage a line like the London tube railways. A passenger coming from the suburbs would travel as he does now up to Howrah or Sealdah, whence the train would proceed underground. At Howrah the rail level would be approximately 100 ft. below that of the station, and the highest portion of the tunnel would pass about 50 ft. below the bed of the River Hoogly. There would be five underground stations, and the heart of the tube system would be Dalhousie Square. Arrangements would be made to deal with 16,000 passengers every half an hour, and trains would draw up on platforms every two minutes. There would be two tracks one in each direction, but each accommodated in a separate tube, the internal diameter of the tunnel being about 14½ ft. Mr. Lydall's scheme aims at a tube thoroughly up-to-date in its equipment, with escalators and automatic ticket machines. The trains will each consist of eight coaches. Details regarding air supply and electrical energy have yet to be worked out, but as electrical energy cannot be purchased in Calcutta, the possibility of generating it in the coal field and conveying it thence will be considered. The decision as to the expert's recommendations rests with the Railway Board, and will probably take some time, but preliminary boring operations to ascertain the suitability of the subsoil are in progress. A tube railway is the only solution of the Calcutta traffic problem, and though the cost is high, the feasibility of such a scheme is unquestioned.

Hydro-Electric Development in Madras.

The latest report by the chief engineer of the Hydro-electric Development Department of Madras Presidency for the year 1928-29, which has just been issued, states that the survey of the new reservoir and dam sites, the penstock profiles, power house site and transmission lines was completed and detailed plans and estimates were prepared. The report on the Pykara project was submitted to the Railway Board, which obtained the opinion of Messrs. Merz and McLellan, whose comments were generally favourable. On their recommendations the designs and estimates were further revised and brought up-to-date. Further in consultation with Messrs. Robert White & Partners, of the South Indian Railway, the proposals for electrifying certain sections of that railway were investigated and a report recommending the electrification of the Trichinopoly-Madura, Dindigul-Ollavakot, Shoranur-Podanur, Metupalayam-Erode, and the Nilgiri railway sections, has been submitted to the Railway Board. Modifications of the Pykara river scheme were evolved so that any programme of railway electrification could be taken up in future, while at the same time the construction of the works could be commenced immediately whether the railway load could be guaranteed or not. The proposals were forwarded to the Central Government for sanction and the construction of the Pykara project will be commenced as soon as sanction is received. Pending the prolonged negotiations between the Government of India and the Railway Board it was decided to undertake the construction of the Glen Morgan project in order that a start could be made towards the electrical development of the Nilgiris and a source of power made available when the main Pykara project is sanctioned. The construction of this project was sanctioned in August, 1928, but owing to delay in the supply of machinery and plant by the firms in England and the fact that the Nilgiri Railway was closed to traffic for three months owing to landslides, the construction was held up. It is expected that the plant will be in operation shortly. The estimated cost including transmission lines, &c., is Rs. 12.38 lakhs. Among the year's activities was the further investigation into the Kolaba scheme. By abandoning the previous idea of a large dam and other costly works, and evolving a more modest scheme capable of extension, it appeared that a commercially feasible proposal might be worked out. Following on a study of the methods used by the Mysore Electrical Department in developing industrial and agricultural load, a conference with tea planters in the Nilgiris was held and the results were satisfactory. Four have promised to take power when available, and others, it is anticipated, will follow suit, the indication being that the load demand in the Nilgiris will exceed estimates. A satisfactory power agreement was concluded with the Ootacamund Municipal Council, which has agreed to accept electrical energy from Glen Morgan and substantially reduce the rates to the ultimate consumer. The Conoor Municipal Council followed suit and decided to install electricity, which was to be supplied from Ootacamund. The Conoor installation will be operated at 11,000 V. In co-operation with the Electrical Inspector of Madras Presidency, and in order to speed up electrical development, efforts are being made to interest private firms to apply for licenses to distribute electrical energy to a group of towns rather than one. Such a system is more economical and will result in quicker development and a more favourable load for hydro-electric plant when it becomes available. The possibilities of developing power at the Mettur Dam now under construction in Madras have been studied and a scheme has been drawn up with all technical details concerning the project. This is now being considered in London and Switzerland, and as soon as it is received from there, a report will

be submitted to Government. Meanwhile, a scheme to take power from the Mysore transmission lines to Mettur and distribute the power to the towns of Erode and Salem is being studied.

Ganges Valley Hydro-Electric Scheme.

A recent communiqué of the United Provinces Government announces that good progress has been made with the Ganges Canal electrical scheme, which will supply electric power to all towns with a population of 5,000 and over in the seven north-western districts of the United Provinces of Agra and Oudh. The scheme in its present form is the development of three local projects, which were individually sanctioned in 1928 as the Sumera hydro-electric scheme, the Bhola scheme, and the Ramganga pumping scheme. The Sumera scheme had for its objective the electrification of Khurja City and the pumping by electrical power of 110 cusecs from the Kala Nadi by means of a weir and supply channel, to increase the supply in the Ganges Canal. The Bhola Falls scheme included the generation of 750 kW, with a 250-kW oil-engine reserve for the electrification of Meerut, Gaziabad, and Hapur, and the laying out of 56 miles of transmission lines. The Ramganga scheme was to provide 2,400 kW hydro power, with 500-kW oil-engine reserve, for the electrification of the Bijnor and Moradabad districts, the East Indian Railway stations, and for pumping 200 cusecs from the Ramganga for irrigation. This project included 176 miles of transmission lines. The aggregate cost of the three estimates was Rs. 91.80 lakhs for works and plant, and Rs. 14¾ lakhs for establishment and overhead charges.

The position now is that the three initial schemes, which were designed as individual projects, have been linked together into a grid transmission system to supply Bijnor, Moradabad, Sararanpur, Muzaffarnagar, Meerut Bulandshah, and Aligarh districts. The electrical scheme will generate power and transmit it to the various points of supply, deriving its revenue from bulk sales. When additional load develops, more falls will be linked into the system. The power stations at Palra and at Bhola have been completed, including the erection of machinery at site, and 56 miles of transmission lines for the original Bhola scheme have been installed. The structures for double circuit lines from Bahadurabad to Sheora have been erected for a length of 86 miles, as well as the single-circuit line from Sheora to Moradabad. For crossing the Ganges and three major rivers spans of over three-quarters of a mile each have had to be constructed on this line. A line from Haipur, on the Bhola system to Moradabad is to be in use by early autumn, which will enable Moradabad to obtain additional power from Bhola. A line from Gaujrala on the latter line through Chandpur and Bijnor to Nagina, with branches to Mandawar and Kiratpur, as also a branch from Dhampur to Nehtore, will be completed by then. The main trunk line from Roorkee to Bhola will be ready by October, and a single circuit-line is under way from Bhola *via* Hapur and Bulandshahir, through Palra power station to Aligarh and Hatras. Out of 156 miles of double-circuit line and 682 miles of single-circuit line at 37,000 volts, the structures for over 243 miles have been completed, and the whole system is expected to be ready by January next. The actual cost of the works and the plant required to complete the electric power scheme is Rs. 74½ lakhs.

Rural Electrification.

A new feature in rural electrical development in India is represented by two important companies which have been brought into existence in the United Provinces by Messrs. Martin & Co., of Calcutta. These are the Upper Jumna Valley Electric Supply Co. and the Upper Ganges Valley Electric Supply Co. The first has been formed for the supply of electricity in the districts of Meerut, Muzaffarnagar, and Sharanapur, and includes 26 towns. The other has been formed to supply in the districts of Bijnor and Moradabad to 16 towns. The authorised capital of each of these companies is Rs. 10 lakhs. They will work in conjunction with the hydro-electric schemes described in the preceding paragraph, which are being carried out by the United Provinces Government, and are rapidly nearing completion. Electricity will be available in 11 of the large towns by the end of the year. The aggregate population of the towns in the Jumna Valley schemes is 231,000, and it is estimated that the capital cost of this scheme will be Rs. 4½ lakhs. In the case of the Ganges Valley scheme, the aggregate population of the 16 towns is 307,000, and the estimated capital cost is Rs. 6 lakhs.

Hydro-Electric Power in Mysore.

The possibilities of a new hydro-electric project are being investigated in the Mysore State. The site is at Chunchankatte on the Cauvery River, about 8 miles from Yedatore in Mysore. There is an anicut (irrigation barrage) across the Cauvery at Chunchankatte, called the Ramasumudram anicut, and below it there are cataracts about 40 to 50 ft. deep. Some 3½ miles upstream is the Chamaraja anicut, from which run irrigation channels on both sides. It is proposed to draw water from the Chamaraja anicut, take it to a channel on the right bank, and pass it through turbines at a point about 17 miles downstream of Chunchankatte anicut. The irrigation head sluice of the Chamraja right bank channel consists of 11 vents, 5 ft. by 6 ft., of which only six are utilised for irrigation. It is proposed to utilise the remaining five for drawing off water for power. It is proposed to construct another new channel parallel to the Chanraja for water power supply with a capacity of 100 cusecs. Gauge readings for the past ten years indicate that, even in the worst years, it will be possible to generate 500 h.p. continuously. A storage of 170 million cubic feet is necessary, and in order to obtain it the Chamraja anicut is being raised about 10 feet. The scheme is estimated to cost about Rs. 5 lakhs, and forms part of the programme of rural electrification recently inaugurated in the State.

Railway Electrification.

It is announced that the G.I.P. Railway main line electrification scheme between Bombay and Poona has been completed, and the electrified service was to be inaugurated this month. The sub-stations and overhead equipment, as well as the locomotive power, are ready. The freight and passenger locomotives to be employed on this section are noteworthy, and indicative of important development in recent locomotive building. These locomotives have been constructed and equipped by the Metropolitan-Vickers Electrical Co. to the specification of Messrs. Merz & McLellan, with special regard to atmospheric conditions. The freight locomotives are said to be the largest and most powerful ever built in England, and are equipped with motors totalling 2,600 h.p., and weigh over 120 tons. Forty-one freight locomotives and 29 passenger locomotives are being obtained. They will operate at 5,000 volts, energy being taken from an overhead line.

Electric Ship Propulsion.

Comments on its Application to Large Passenger-carrying Liners.

By ESKIL BERG, M.Amer.I.E.E., M.Amer.Soc.N.A. and Mar.E.

(Extracts from a paper read before the Institute of Marine Engineers.)

RECENTLY electric propulsion has been applied to the two largest passenger ships built in the United States of America. Both ships were built by the Newport News Shipbuilding Co., and the complete electrical equipment was designed and built by the American General Electric Co. The boats operate between New York and San Francisco: the first was the s.s. *California*, which made her maiden trip from New York on January 28th, 1928, and has been in continuous and most successful operation ever since. The second ship, the s.s. *Virginia*, of the same line, made her maiden trip from New York on December 8th, 1928. The data of her performance during the second trip will be used in this paper, as during that run accurate readings were taken of all the power used; that is, readings were taken every 15 minutes of volts, amperes, power factor, and kilowatts. The power readings were also checked by integrating wattmeters, so that the power of the ship was measured correctly within one-fourth of one per cent.

For the main propulsion there are installed two steam turbine-driven generators, having a rating of 6,600 kW at 2,880 r.p.m. At full power the voltage is 4,000 volts, and three-phase current is used.

There are two motors, each directly connected to a propeller shaft, of the synchronous induction type, this type being lighter and more efficient than the induction type. They have a normal rating of 8,500 h.p. at 120 r.p.m. and each has six circuits in multiple; in other words, while the motors appear to be just one, there are in reality six independent motors. If damage should be done to one coil, all that would be necessary would be to cut the coil open with a hack saw, separate and tape the ends, and only one-sixth of the power of that one motor would be lost. Under full-power operation each motor

is connected to one turbo-generator, making two complete units entirely separated from one another. At reduced speed, however, only one turbo-generator can be used to drive both motors, and under this condition a speed of 15½ knots can be maintained (during trials 16 knots were run).

The control apparatus consists of contactors for closing the electrical circuit between the generators and the motors. There are two main operating levers for each motor, and two small wheels on the operating board that regulate the speed (r.p.m.) of the motors. One lever has three positions—

TABLE I.—PARTICULARS OF S.S. *Virginia*.

Length, overall	613 ft. 1½ in.
Beam, moulded	80 ft. 3 in.
Depth to shelter deck	52 ft.
Load draught	33 ft. 9¾ in.
Displacement, tons	32,800.
Capacity of fuel oil, tons	5,436.
Rated shaft horse-power, continuous	17,000.
Speed	18 knots.
Passenger capacity, first class	400.
Passenger capacity, tourist class	400.
Freight capacity, tons	8,500.
Refrigerating cargo capacity	100,000 cu. ft.

"ahead," "stop," and "astern"—the other controls the excitation of the motor and the generator and has four definite positions: "off," "1," "2," and "run." On "1" position double excitation is applied to the generator alone; in this position with the reverse lever on either "ahead" or "astern," the propelling motor is started ahead or reversed as a pure squirrel-cage induction motor. In "2" position normal excitation is applied to the motor field, leaving double excitation on the generator; in this position the motor phases in and becomes synchronous. Position "run" reduces the excitation of the generator to normal.

Speed regulation of the propellers is by varying the speed of the turbine by a small wheel on the control board, which changes the governor setting of the turbine. All the switching is done with dead circuits, as an interlock is provided by which the operating lever cannot be moved before the excitation lever is on the "off" position. The switches are, however, designed to operate under full-power condition in case anything should happen to the interlock.

The boilers on the *Virginia* are of the regular Babcock and Wilcox marine type, thirty sections wide, with tubes 10 ft. 6 in. long. The heating surface per boiler is 5,461 sq. ft., or a total for eight boilers of 43,688 sq. ft. Each boiler is fitted with a Babcock & Wilcox interdeck superheater having 601 sq. ft. of surface, or a total for the eight superheaters of 4,808 sq. ft. Babcock & Wilcox feed-water regulators are fitted on the drums of all boilers. The front plate of each boiler is equipped with six Babcock & Wilcox mechanical atomiser oil burners of the "Cuyama" type. On the full-power run from Balboa to San Diego (2,829 knots) the *Virginia* averaged 18.4 knots, and only six of the eight boilers were in use, showing that her boilers could easily be cut down in size.

The condensers are bolted directly under the turbine to the turbine casing, no expansion joint being used. A spring beam under the condenser takes care of any expansion due to temperature changes. Each condenser has 11,000 sq. ft. of cooling surface, consisting of ¾-in. tubes; each has two Warren 18-in. centrifugal circulating pumps, having a capacity of 8,000 gal. per minute against a 30-ft. head. They are each driven by a 100-h.p. direct-current motor, 325 to 600 r.p.m. per minute. The condensate pump is also electrically driven; its rating is 210 gal. per min. against a 60-ft. head, driven by a 7½-h.p. motor at 1,200 r.p.m. Air ejectors are used of the Wheeler 2-stage "Radojet" type.

Auxiliary Electric Power Plant.—As all the refrigeration, cooking, baking, and heating of the staterooms are electric, the power plant is rather large, consisting of four 500-kW, 240-120-volt, 3-wire system, direct-current geared turbo-generator sets. There is one condenser for each two sets, with valves, so that either set can be operated alone on the condenser, or both at the same time. Each condenser has 2,800 sq. ft. of cooling surface, using ¾-in. tubes. One motor-driven circulating pump of 3,600 gal. per min. capacity is provided for each condenser, the motor having a rating of 30 h.p. at 675-900 r.p.m. The condensate pump is also motor driven and Wheeler 2-stage air ejectors are used.

The *Virginia* has 60,000 cu. ft. of cool air space for carrying fruit and also 40,000 cu. ft. of frozen cargo space. There are four Brunswick-Kroeschell CO_2 3-cylinder compressors, each driven by a 100-h.p., 250 to 325 r.p.m., direct-current motor. The air is circulated through the cold air system by four blowers, each of 25,000 cu. ft. capacity. The whole refrigerating system, with all its pumps, &c., is motor-driven and, when running at maximum capacity, consumes about 800 h.p.

The whole galley is electrically equipped. There are, among other things, twelve large ranges and two bake ovens, the latter having a capacity of 180 1-lb. loaves of bread. The electric galley has proven itself most economical and will be adopted on all the new ships operated by the Panama-Pacific Line.

Steam Consumption.—When operating at 275 lb. pressure at the throttle and 200 deg. superheat with a vacuum of 28.5 in., the steam consumption per shaft-horse-power-hour with 17,000 h.p. delivered to the propeller shaft, including all the losses in the generator, motors, cables, and control, is 8.1 lb.

Fuel Consumption.—On the second voyage west the ship ran at full power from New York to Havana, and the fuel consumption was 0.715 lb. of oil per s.h.p.-hour. The same results were obtained from Balboa to San Diego (a distance of 2,829 knots) and also from San Pedro to San Francisco. The figure of 0.715 includes everything on the ship and, when it is considered that all the cooking and baking are done electrically, and that a very large refrigerating plant is in operation most of the time, due to the fact that the ship carries bananas and other fruit and has a refrigerating cargo space of 100,000 cu. ft., the figure of 0.715 is indeed a very fine result. It has been maintained and even slightly improved on a subsequent trip of the *Virginia*.

Electrical Losses.—At 17,000 h.p. and 120 r.p.m. of the propellers, the generators have an efficiency of 97.5 per cent., excluding excitation, which amounts to 32 kW per generator, or less than ½ per cent. The motors have an efficiency of 98¼ per cent., excluding excitation, which amounts to 0.68 per cent. The loss in cables, control, &c., amounts to 0.04 per cent. The total transmission loss is, therefore, excluding excitation, about 4¼ per cent., and with excitation about 5¼ per cent. At reduced speed of the vessel the efficiency of the generators and motors remains practically constant, as the voltage is then reduced in about the proportion of the square root of the horse-power, so that at three-quarter speed the voltage is reduced from 4,000 to 2,600 volts. The transmission loss has only increased from 5¼ to 5¾ per cent., although the power has been reduced from 17,000 to only 7,000 h.p.

The advantages of electric drive for large liners are:—

1. Electric transmission gives a simple and practical means of speed reduction between the high-speed turbine and the low-speed propeller in almost any ratio.

2. It affords means of reversal by simple change of electrical connections, without changing the direction of rotation of the turbine, and thus eliminates the space occupied by reversing turbines and their loss is incurred while the ship operates in a forward direction.

3. Any desired reversing torque up to the full power of the turbine can be obtained without in any way affecting the efficiency of the equipment in the forward direction.

4. It allows the turbine as a rule to be built in one casing, an ideal condition for efficient design, eliminating all losses due to crossover connections and reducing the number of packings and steam seals.

5. Reversal of the propellers is obtained with a minimum amount of steam drawn from the boilers, as the full inertia of the turbo-generators is first used in the act of reversal; in fact, in most cases actual reversal is obtained without drawing any steam from the boilers, and steam is only used from the boilers to accelerate the speed in the reverse rotation. This fact releases all strains on the condenser tubes and prevents leakage; in fact, condenser troubles are practically eliminated on electric ships.

6. Makes it possible to obtain accurate data, either by instantaneous readings or by recording instruments, of the load on the propeller shaft under all conditions of sea and wind; it eliminates the use of torsion meters; the total horse-power-hours can be recorded during any given time.

7. It is possible to obtain very fine economy at three-quarter speed, as during that time only one-half of the generating unit with its auxiliaries will be used; under this condition the fuel consumption per shaft-horse-power will be practically the same as at full power, a very important consideration for the very high-speed, high-power, liners now being contemplated, as these ships can be run during off season at slower speed and still maintain maximum efficiency.

8. Allows the power generating unit, or units, to be put in any convenient place near the boilers, thus greatly simplifying the steam piping; they can also be put on any convenient height, and the condenser can be mounted directly under the turbine.

9. It has been found that the make-up water on the electric ships is less than one-quarter that on any other type of similar steamer.

10. The propelling motors can also in most instances be put near the propellers, eliminating long, expensive, shafting with its many bearing losses.

11. With the electric drive the adoption of high steam pressure and superheat is ideal. As the turbine is never reversed, it cannot have extreme temperature changes. Stage extraction for heating the feed water becomes a very simple matter and has proven itself most attractive and simple on the electric ships.

12. Electric ships can be made practically noiseless, and the absolute absence of all vibration and noise on the *Virginia* is striking and always most talked about among the passengers.

Performance.—The complete log data of the second voyage of the *Virginia* are given in the paper, the following being a summary:—

On her trip from New York to San Francisco, a distance of 5,429 knots, the time of the sea passage was 12 days, 16 hours, 25 minutes.

Total oil consumed sea passage	1,643 tons
Average speed	17.8 knots
Average slip	13.6 %
Oil per s.h.p.-hr. between pilot stations	0.7396 lb.
Oil per 24 hours	129.6 tons
Oil per 100 knots	30.3 tons

On her return trip from San Francisco to New York the following results were obtained :—

Distance	5,441 knots
Time of sea passage	12 days, 22 hrs., 28 min.
Total oil consumed, sea passage ...	1,584 tons
Average speed	17.5 knots
Average slip	11.4 %
Oil per s.h.p. between pilot stations	0.739 lb. per s.h.p.-hr.
Oil per 24 hours	122.4 tons
Oil per 100 knots	29.10 tons

Comparison.—Just recently a large new twin-screw liner, equipped with Burmeister & Wain double-acting, 8-cylinder, 4-cycle engines, had her performance published in the *Marine Journal* (New York, February 1st, 1929, issue). The particulars of this ship, as compared with the *Virginia*, are as follow :—

	Diesel Ship.	*Virginia.*
Length	608 ft. 9 in.	613 ft. 1½ in.
Width	78 ft.	80 ft. 3 in.
Displacement ...	26,700 tons	32,800 tons
Draught	29 ft.	33 ft. 9½ in.
Speed	18 knots	18 knots
Horse-power	26,000 indicated	17,000 s.h.p.

At 16.18 knots the starboard engine indicated 9,045 h.p. and the port engine 9.035 h.p., or a total i.h.p. of 18,080. Fuel-oil consumption, excluding lubricating oil, 77 tons for all purposes. Mean draught of ship 25 ft. 8 in. The *Virginia* under this condition needs but 11,500 h.p. to drive and her total fuel consumption is but 96 tons. As Diesel oil at the time of writing cost in New York just twice the price of fuel oil, the 77 tons of Diesel oil become the equivalent of 154 tons of fuel oil, and compares with 96 tons for the *Virginia*, which is a much larger ship. The weight of all the machinery on the *Virginia* is less than that of the Diesel ship and the space is also less, as well as the cost. It appears, therefore, as if the Diesel-engine drive for large passenger liners may not be correct from an engineering point of view, and we know that a great many of the passengers do not admire it from the point of comfort, due to its vibration. The wonderful success, economy, and popularity of the *California* and *Virginia* have drawn the attention of the whole marine world. The Ward Line and the Grace Line have recently adopted this type of drive. The Peninsular and Oriental Steam Navigation Co. has completed the big liner *Viceroy of India** with electric drive furnished by the British Thomson-Houston Co., Ltd., England, an associate company of the General Electric Co., of America. Her performance will be even better than that of the *Virginia* on account of higher steam pressure and superheat. At 18.5 knots, *Engineering* (London) reports so little sign of movement or vibration that it is hard for a passenger below decks to believe the boat is not stationary. The popularity of all-electric liners is going to be so great that the travelling public is going to demand them, and with the adoption of high steam pressure and superheat and stage extraction for heating the feed water, the economy will be so good that Diesel ships, even if the fuel price were about the same, could not compete due to the lighter weight, less space, upkeep, and first cost of the electric drive.

A great deal of attention has lately been given to the wonderful performance of the *Bremen*, and the published data credits her with a fuel consumption of 0.685 per s.h.p. for all purposes. This compares with 0.715 on the *Virginia*.

	Bremen.	*Virginia.*
Boiler pressure	330	300
Temperature steam ...	700 deg.	621 deg.
Vacuum	28.5 in.	28 in.
Boiler efficiency	85 per cent.	80 per cent.
S.H.P.	110,000	17,000

The higher boiler efficiency of the *Bremen* is because her boilers are equipped with economisers and air preheater. Making proper allowance for the higher steam pressure, superheat, vacuum, and boiler efficiency, and the fact that more efficient turbines can be designed for 110,000 s.h.p. than for 17,000 s.h.p., the 0.715 for the *Virginia* would be reduced to 0.61, as compared with the *Bremen's* 0.685.

For the very large and fast liners which are at present being considered, the General Electric Co. (America) and also the British Thomson-Houston Co. have made up rather complete and tentative designs, but they cannot be published at this time. The overall economy is, however, so good that no one should seriously consider any other type of drive. The installation of the machinery in the engine room is simple, and all steam piping is reduced to only a fraction of that required for a geared-turbine job similar to that of the *Bremen*. There is no doubt that such an installation will prove itself successful from the start, and will open up a new era in marine propulsion for high-powered, high-speed liners.

* Elec. Rev., March 8th and 29th, 1929.

Overhead-line Construction.

Some typical examples of Aerial Electric Power Transmission and Distribution Lines and Manufacturers' Notes on their Component Parts and Associated Equipment.

(*Concluded from page 654.*)

The construction and maintenance of overhead lines demand of necessity the occasional use of the saw and pruning knife, but what havoc is not infrequently done with ornamental trees before the linesman awakens to the facts that tree, wire, and aerial cable can be used to advantage, and that if a stately tree must be trimmed the operation can be accomplished without the loss of any of its grandeur. The stigma of tree and countryside desecration must not be allowed to rest on overhead-line engineers, for many people will remember few of their other faults and refuse to admit any of their improvements and services rendered in extenuation.

The Postmaster-General has agreed to make an interesting experiment as a result of protests made by the New Forest Association against the use of a bright red insulation for overhead conductors, and a bright green covering is to be used on telephone wires in Hampshire, as an attempt to achieve some degree of harmony with the prevailing hue of that beautiful region.

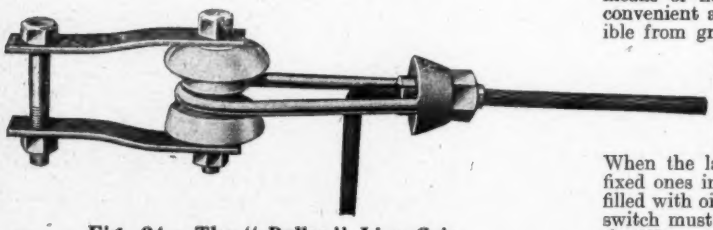


Fig. 24.—The " Buller " Line Grip.

Bullers, Ltd.

Ease of fixing is the outstanding feature of the line-gripping device illustrated in fig. 24, which is very useful when it is necessary to make-off heavy conductors for low-voltage distribution. All sizes are made for taking conductors up to 0.750 sq. in.

English Electric Co., Ltd.

A considerable factor in the problem of rural electrification is the cost of tapping off relatively small amounts of power from the e.h.p. transmission lines. Fortunately the expense of sub-station building can be obviated, since the whole of the transforming, switching, and protective gear can be designed for outdoor installation. A variety of apparatus specially suitable for this work and of economical design has been developed by the English Electric Company. Small amounts of power may be tapped off 6.6-kV or 11-kV overhead lines by means of horn-break, pole-mounted switch-fuses, which are convenient and safe, as no parts at the line voltage are accessible from ground level, the gear being operated by means of a long rod, and the fuses are swung down for replacement. Oil-immersed switch-fuses have been developed for capacities up to 100 amperes and voltages up to 33 kV. The fuses are held between spring-loaded plungers attached to contacts mounted on insulators on the hinged lid. When the latter is closed the movable contacts engage with fixed ones in the bottom of a steel tank, which is completely filled with oil. An interlocked isolating device ensures that the switch must be opened before the lid can be opened and that the lid must be closed before the switch is closed. A further attachment, especially suitable for outdoor use, is a protection cover which automatically covers the oil tank when the lid of the switch is opened. Semi-outdoor switching centres utilise these oil-immersed switch fuses, situated at the foot of a transmission line pole.

A simple outdoor sub-station suitable for use where low cost is of primary importance consists of an oil-immersed pole transformer connected to an overhead line through air-break fuses mounted on porcelain insulators; below the transformer a weather-proof sheet-steel l.p. distribution box may be also

mounted on the transmission-line poles. Other similar examples are the 75-kVA outdoor transformer illustrated in fig. 27, and a 10-kVA transformer tapped off one phase of a 33-kV line direct through fuses mounted on a framework attached to the transformer tank.

The widely-scattered distribution area which is often characteristic of rural electrification makes the problem of maintaining the voltage at consumers' terminals within the prescribed limits somewhat acute. The company has developed small automatic feeder-voltage regulators of a weatherproof type to meet these conditions, and numerous instances have shown that it is often more economical to install an induction regulator than to try and achieve the same result by increasing the copper section of the distribution conductors. The small outdoor regulators are made in two sizes, rated at 3 and 5 kVA, respectively, on a 50-cycle circuit, and are built for either single- or three-phase distribution. They are capable of regulating the voltage by plus and minus 10 per cent. on 30- or 50-kVA distributors, or by a correspondingly smaller amount on a feeder of larger kVA. The regulator and operating gear are self-contained in a specially treated, close-grained, cast-iron tank with a weather-proof lid and inspection door. Fig. 28 shows one of these indication regulators mounted on a pole, together with a static balancer for a three-wire single-phase circuit, while a three-phase regulator may be mounted in a kiosk for semi-urban application. The operating gear that has been developed for these regulators has no contacts to deteriorate, being actuated on a simplified "Thury" principle from a small continuously-running motor requiring the minimum of attention.

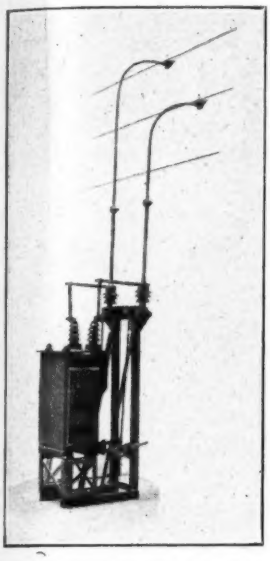


Fig. 25.—New "F.P." Live-line Tapping Device.

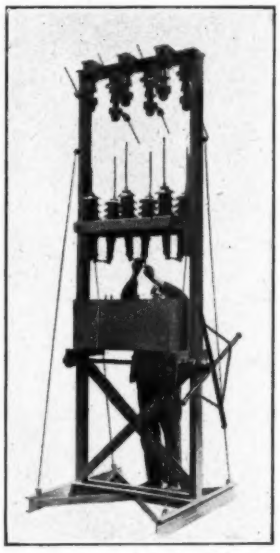


Fig. 26.—Oil-immersed Fuse Gear.

Ferguson, Pailin, Ltd.

The following descriptive notes on improved and new designs of this company's manufactures should not omit to mention that its line of air-break rocket-type switches manufactured in 11-, 22-, and 33-kV sizes up to 300 amp. capacity has been improved in the following details:—The flexible connection between the moving and fixed insulators is so constructed as to be under no mechanical stress. The control mechanism embodies a positive rod drive with "on" and "off" stops to prevent undue movement of the rocking portion. The bearings are babitted throughout, and grease caps are provided at essential points. All ironwork is now hot-dipped galvanised after all machining operations have been performed.

The single-pole oil fuses have now been applied to a wider field by the following alternative fitments:—(*a*) The 11-kV pattern is now available for the entry and exit of bare copper rod, the unit being so designed as to prevent grounding the line conductor through a bird alighting on the top of the unit. (*b*) An attachment is provided for clamping the plug element to the fuse body to ensure a watertight joint, which enables the unit to be used for underground service. When the clamping attachment is unscrewed, the fuse element may be withdrawn.

Fig. 25 illustrates a new single-phase device for tapping a live line. At present this design is available up to 33 kV line pressure for single-phase or 3-phase tappings. The equipment comprises the fabricated supporting structure, oil-immersed power transformer with expulsion withdrawable-type e.h.p. fuses, tilting line-tapping connection operated through a rod driving mechanism from near the ground. The flared contact is said to be of unique construction, having a swivel joint to permit restricted movement of the line conductors.

Fig. 26 indicates a new way of providing oil-immersed fuse protection for a single-phase or 3-phase supply tapped from an overhead line. The design embodies a double- or triple-pole oil-immersed fuse of moderate rupturing capacity, which is disconnected from the line tapping by vertical isolation in a downward direction. To inspect the fuses, the fuse unit is further lowered on to the supports, the bolts removed, and the upper portion raised, thus exposing the fuses for inspection or for replacement.

A metal-clad outdoor switch-fuse primarily designed for cable connection is at present designed in 11- and 33-kV sizes and embodies a special fuse having high rupturing capacity. The switch-fuse is of the quick-break type.

A. Reyrolle & Co., Ltd.

One very important way of effecting economy is to carefully study sub-station buildings and switchgear, with a view to reducing their cost, which has led to schemes for doing away with buildings altogether, and using switchgear that may safely be exposed to the weather. This has proved to be quite successful, especially in outlying rural districts, and this Company has developed a line of controlling apparatus embodying simple protection in the form of switch-fuses, which are metal-clad, and the circuit is broken under oil. They consist essentially of a group of oil-immersed switches in which the circuit-breaking parts are fusible cut-outs mounted on the underside of the lid of the tank containing the whole arrangement, and overload protection is also afforded in an economical way. Switch-fuses are made mostly for three-phase circuits, but are adaptable and made suitable for pressures of from 660 V to 33 kV. The self-aligning fuses are spring-mounted, and are carried on permanent porcelain supports fixed on the underside of the lid, as shown in figs. 29 and 30, so that the closing and opening of the lid makes and breaks the circuit. The lid is operated by means of a pole, and balance weights assist in swinging it back, so arranged that it comes to rest clear of the fuse tank, and may be swung with ease into such a position that it is quite safe to inspect the fuses or to work on them. Switch-fuses can be fitted with current-transformer chambers, cable dividing boxes, and the like, to meet a wide range of conditions and requirements, and metering and indicating transformers can be incorporated both in unit and in composite equipments.

Electric Control, Ltd.

It is generally somewhat difficult to examine overhead-line equipment in service closely enough to fully appreciate its features, owing to the fact that it is usually mounted on towers at a considerable distance from the ground, and because it is more often alive at high voltage and cannot be shut down. These considerations should render the exhibition of apparatus by Electric Control, Ltd., at its Westminster showrooms particularly welcome to interested engineers, as typical equipment is mounted on structures with operating mechanism and

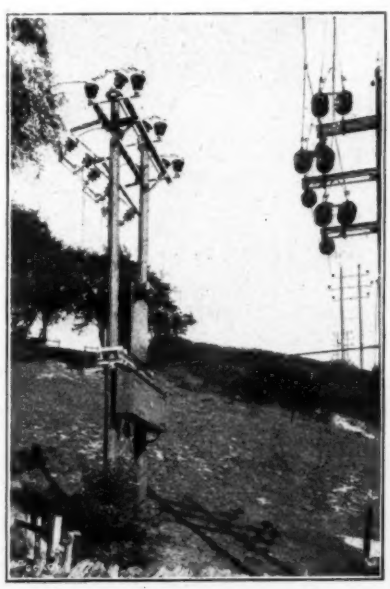


Fig. 27.—Transformers Tapped-off 33-kV Line.

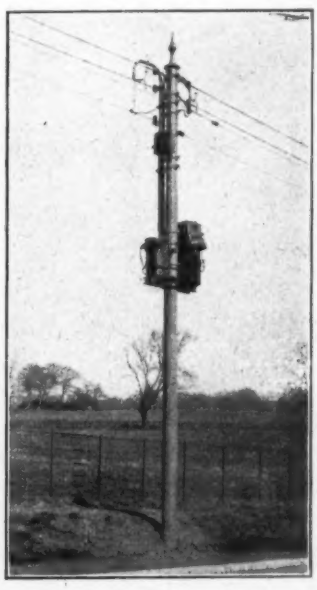


Fig. 28.—Pole-type Induction Regulator and Balancer.

various details in a convenient form for close examination. Various forms of mounting are standardised and the undermentioned features are possessed by all standard "Empire" equipment. The insulators used are of British manufacture and their electrical characteristics are claimed to exceed the B.E.S.A. specification for corresponding voltages. The caps and pins are jig fitted and cemented by the makers' special steam-setting process, which method of attaching the caps is declared to be superior to the use of clamp fittings. After the insulators are fitted with their caps and pins, they are rigged up in a jig and then put in a steam oven and go through a temperature cycle considerably greater than the switchgear is subjected to in service, whilst the cement is setting; the result is a high-class cemented joint which does not give trouble in service and setting them up in jigs first ensures interchangeability of the insulator. The current-carrying parts are rated to carry 200 amperes continuously and are cadmium plated throughout; thus there is no risk of electrolytic action taking place between metals of dissimilar nature when in contact. The cadmium plating also stands up very well to bad atmospheric conditions and is said to have proved very satisfactory since it was introduced some

Fig. 29.—Reyrolle Switch Fuse.

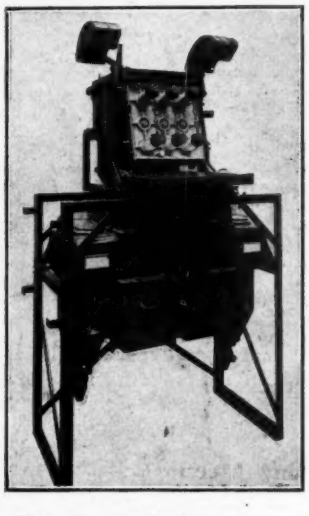


Fig. 30.—Switch-fuse, Open.

three years ago. Steel parts are all hot galvanised after the drilling and machining are finished. Solderless mechanical cone-grip line connectors are fitted, which avoid the use of sweating sockets, and the collets are drilled out to suit the size of the conductor being used, so that the joint can be easily made on site without the use of any soldering equipment. Disconnecting switches are so designed and constructed that each phase is erected separately, and provision is made for alignment adjustment to compensate for inaccuracies in the supporting framework or structure. The rocking insulators are mounted in bearings with rustless-steel pivots working in gun-metal bushes, and care is taken to avoid mechanical stresses being transmitted to the insulators when the switches are operated.

Fig. 30 shows an 11,000-volt, 200-A, outdoor t.p. vertical combined isolating fuse and switch mount; choke coils may be added when required, the fuses being of 50-ampere rating. The 66,000-volt disconnecting switch has a balanced movement and snow shields over the contacts.

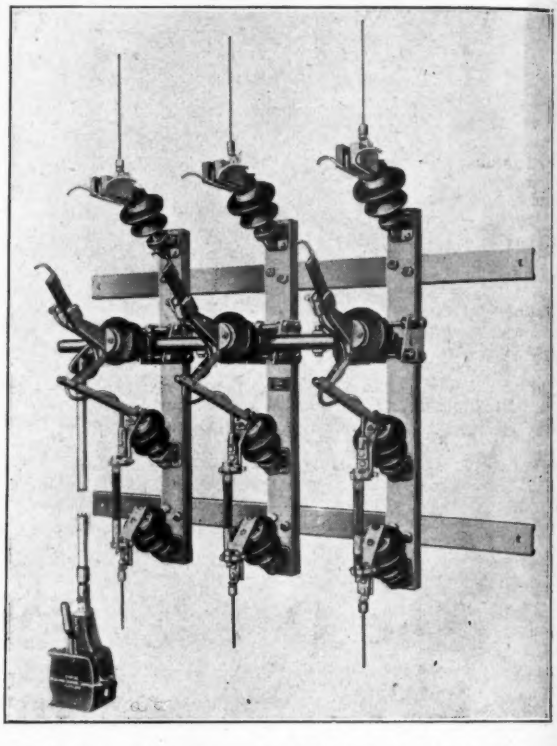


Fig. 31.—"Empire" Combined Switch and Fuse Mount.

It is understood that the company undertakes to refill "blown" fuses free of charge for a period of three years from the date of dispatch; the company has been manufacturing a complete range of high-voltage fuses for from 6,600 V up to and including 132,000 V for many years now, and 20 different fuse ratings from 1 up to 400 amperes. The high rupturing capacity and the speed of operation are claimed to make the fuses ideal for short-circuit protection and seem to be very useful, especially in connection with the e.h.p. systems, for protecting potential transformers and isolating faults in them.

Electricity Generation.

A Review of the Electricity Commissioners' Return for the Year 1928-29.

THE Electricity Commissioners' annual return of generation in Great Britain was published last week.* Unlike some government publications (such as, for example, its big brother the full statistical return of supply undertakings), this one is published with commendable promptitude whilst the figures are fresh and topical. In the present case, and in most previous years, the figures for the twelve months ending March 31st have been published by October of the same year, which must be reckoned quite good going! The figures indicate the steady all-round improvement which we have come to expect, both in output and in efficiency, though without any very outstanding development. The number of stations is at last on the decrease; actually 27 stations were permanently closed down, but owing to the putting into commission of ten new and three existing standby stations and the inclusion of eight other existing stations previously outside the scheme, the net reduction was only six.

* *Generation of Electricity in Great Britain—Year ending March 31st*, 1929. H.M. Stationery Office, 1929. Price 1s. 6d. net.

Interest naturally focusses first on the question of total output—what is its increase, and how does it compare with those of previous years. The following table gives the last four increases:—

Year ending March 31st.	1926.	1927.	1928.	1929.
Increase on previous year ...	9.5%	3.0%	18.7%	9.6%

Of these four years the two middle ones must be regarded as abnormal, since the coal dispute of 1926-7 resulted in a serious set-back which was followed by a spurt the year after. If these middle two are taken together it will be seen that there has been a steady growth of slightly under 10 per cent. per annum, and that the year under review has succeeded in maintaining this rate of growth.

As before, an enormous proportion (over 95 per cent.) of the generation was carried out in steam stations. Of the remainder, 2.2 per cent. was from waste heat, 1.4 per cent. from water, and 0.7 per cent. from oil engines. Omitting the latter, the next point to study is therefore the fuel efficiency, as expressed either in coal consumption per unit or in thermal efficiency of station. The latter method takes account of the calorific values of the fuel, but cannot very well be expressed as an average

for the whole country. The table below summarises the position in this respect, and also the figures for the number of stations and the outputs already referred to. It will be seen that the efficiency improvement is a substantial one, but it is difficult to say, until the figures are published for plant installed, how much of this is due to better utilisation of existing machines and how much to new and better ones.

	This Year.	Change from Last Year.
Number of generating stations	564	6 less
Number of kWh generated ...	10.879×10^9	9.6% more
Fuel consumed in steam stations	9.56×10^6 tons	3.7% more
Average consumption ,, ,,	2.05 lbs. per kWh	5% less

The blue ribbon of electricity generation—for the highest thermal efficiency—has now been wrested from Barton station, though by only the narrowest of margins. In the previous year Barton achieved 21.07 per cent. This time it beat its previous record and reached 21.31 per cent., only to be outpaced by Padiham (Lancashire Electric Power Co.) at 21.35 per cent. This figure was reached in spite of a very much smaller output, and the next few years may see an exciting neck and neck race between them—until some of the newer stations come in and outdistance them both. An interesting table in the return illustrates the general effect of station size upon fuel consumption per unit. The stations are put into groups according to their outputs, and the fuel consumption is averaged for all stations in the group. The table is too long to quote in full, but the following selection (taking alternate groups) gives an idea of the results :—

Group	A	C	E	G	I	K
Output (10^6 kWh)	Over 200	50-100	10-25	2.5-5	0.5-1	0.1-0.25
Lb. of coal per kWh	1.73	2.00	2.48	3.40	7.02	11.68

It is a mistake to lay too much emphasis upon averages, and although *on the average* the larger the station the better its efficiency, it is quite possible for an individual station to stand well out above its neighbours of similar size, and even to beat the best of much larger stations. Thus Padiham (group C) has a higher thermal efficiency than any station in the larger groups A and B. Similarly Hartshead (Stalybridge Tramways) in group D beats the best station in group B, whilst Darwen Corporation (group G), Whitehaven Corporation (group H), and Colne Corporation (group K), are each of them better than the best of the previous groups. The case of Darwen is exceptional, however, because steam is also employed from a refuse destructor.

In the main body of the return each individual station is listed, together with its output, rate of consumption, thermal efficiency, maximum load and annual load factor. The load factors vary enormously, and taken by themselves are not very informative. Frequently a high load factor is due to a station being one of a group and run as a base-load station in order to utilise fully the most efficient plant. In other cases load factors of 70, 80, and even 90 per cent. are listed, due to the station being in operation only part of the time. The return differs from its predecessors in giving full particulars of these part-time stations, and in many cases the load factor is calculated on the actual number of running hours. Omitting these cases, which cannot be regarded as representative, the return shows only five " full-time " stations with load factors of over 50 per cent. The highest of these—Horden B of the Newcastle-upon-Tyne Supply Co.—claims a load factor of 86 per cent., but this is exceptional, and the other four cases are all under 55 per cent.

Referring finally to generation other than by steam, perhaps the most interesting method is that of water power which, although it represents so small a proportion of the whole, yet it shows an actual increase over the previous year of 44 per cent. Generation from oil engines also shows an 18 per cent. increase, with a 3 per cent. drop in fuel consumption per unit, but it must be remembered that this method accounts for only a negligible fraction of the total output.

The Overhead Lines Association.

A Report of the Proceedings at the Opening Meeting of the 1929-30 Session.

THE annual general meeting of the Overhead Lines Association preceded its first ordinary general meeting of the 1929-30 session in London on October 16th. Mr. W. Fennell, the retiring president, was in the chair at the former meeting.

Articles of Association.

Notice was given that it was proposed by the Council to revise the Articles of Association so as to provide for the carrying out of most of the ordinary functions of the Association by by-laws, thus following the example of the Institution of Electrical Engineers to a great extent. A sub-committee of the Council has been appointed to deal with the Articles, and will submit the revised Articles to the members as soon as possible. In this work the sub-committee will have in mind the intention of the Association to apply for incorporation as soon as funds are sufficient to meet the necessary expenditure. Apart from the simplification of the by-laws, it is proposed to extend them in certain respects. For instance, it is the desire that the Association shall have vice-presidents, and provision will be made in the revised Articles for their election. It is also proposed that provision be made for the selection of a president-elect at some time during each session, who will be elected automatically at the commencement of the following session.

Officers and Council.

The following gentlemen were elected to the offices indicated for 1929-30 :—

President: Mr. Theodore Stevens (who has previously served as hon. secretary).

Vice-presidents: Mr. W. C. Bexon and Mr. B. G. Drummond. (The Articles of Association do not yet provide for the appointment of vice-presidents, but they will automatically assume office when the revised Articles are approved.)

Hon. secretary: Major Theodore Rich.

Members of Council: Mr. R. Borlase Matthews (past president), Mr. W. P. Gauvain, Mr. A. L. Stanton, Mr. F. Christy and Mr. C. Wade (Associate Member).

Hon. auditors: Mr. Swarbrick and Mr. Napier Prentice.

The Session's Work.

Mr. W. Fennell, before relinquishing office as president, made a statement on the work of the Association during the past session. So far as the president might control the policy of an association having an active council, he had tried during this second year of the Association's work to avoid any agitation for the relaxation of regulations. The amended E.C. Regulations for Overhead Lines were issued in the spring of 1928, and it was only fair to work them for at least twelve months before dealing with them.

The Post Office, a few months ago, had given way on the second-comer claim, to which end he had devoted much of his time during the last five years. The potential value of that concession was very great, because a great injustice had been removed and expense had been obviated.

In making a plea for greater freedom for electricity supply engineers in regulations relating to overhead work, he said it had been recognised for many years that the average electricity supply engineer was as expert in underground cable work as the average assistant to the Board of Trade electrical inspector, and the inspectors left it at that and did not multiply detail. Because engineers felt full responsibility for results, they were careful and thoughtful. As a result, the art of cable, transformer, and switchgear manufacture had advanced unhindered. His aim had been that engineers should achieve that standard of freedom and full responsibility in overhead work which they had always had in underground work. With the same object in view he had endeavoured, in conjunction with the Council, to secure a set of papers which would enable the members of the Association to obtain and to demonstrate their knowledge and caution in overhead construction work. In other words, the session had been a technical and not a political one. He had also helped to initiate and to edit a monthly abstract of all papers and proceedings of the Association. The Council had been considering standardisation and wayleaves. The railway crossing difficulty had become acute, and the Association had been in close touch with the railway companies on that matter.

The membership of the Association had increased considerably during the past year; also, the Association was represented on the Overhead Lines Committee and the Overhead-line Materials Committee of the British Engineering Standards Association, and upon the British Electrical and Allied Industries Research Association Ferro-concrete Poles Committee.

Wayleave Agreements.

Mr. T. Stevens, the new president, was in the chair at the ordinary general meeting, at which attention was devoted to wayleave agreements. The Association's summary of its work on the standardising of wayleaves for rural electric lines has been published in the Electrical Review, August 16th, 1929, p. 298. The views of the Council are that a standard wayleave form with an official backing is greatly needed by electricity supply undertakings to facilitate progress. The ideal form must essentially be standard, simple, and short; it should provide both legal and practical protection to both parties; it must definitely fix every condition that it mentions; there should be no blanks (except names and the schedule) to be filled in;

solicitors' fees should be rendered unnecessary, if the form has authoritative legal approval; and a recognised schedule of payments is of the utmost importance, for landowners and undertakers both want a definite guide as to what is fair. The Association has put forward proposed schedules for distribution and main lines.

The President, opening the discussion, said the Association had evolved the simplest wayleave form ever evolved. The only trouble was that the lawyers would not look at a simple form, but it was worth while setting an example of simplicity. The I.M.E.A. had published a form, and the only objection he had to it was that blanks were left for every one who signed it to put in different conditions; that was not a standard wayleave form. The form put forward by the Electricity Commissioners had been compiled by a solicitor. Though he appreciated highly the work of solicitors, the farmers, landowners and engineers ought to be able to make their wayleave agreements themselves, without the intervention of solicitors.

Mr. R. Borlase Matthews (past president), who urged the need for a standard wayleave form with an official backing, emphasised the well-known psychological fact that if people saw an agreement in print they were prepared to accept the conditions laid down in it as having been carefully thought out and agreed upon, and were usually prepared to sign it. Further, if the ideal form were standard, simple, and short, and capable of being understood by the man in the street, he was still more likely to sign it. Perhaps 5 or 10 per cent. of the people who were asked for wayleaves would protest when asked to sign such a form, but it was worth while producing it if the remaining 90 or 95 per cent. would sign it. It was essential also that there should be a scale of payments fair to all parties, because the ordinary man did not know what to ask for a wayleave, but, if he were shown a scale of payments which was recognised throughout the country, he would accept it as being fair. No agreement would be acceptable if it were not fair to both sides. One of the grievances among farmers was that when they were asked to give permission for transmission lines to cross their land, and when they in turn asked for a supply of electricity from those lines, it was sometimes refused, because the lines were high-voltage lines. As a result, there was a movement among the farmers' organisations to recommend farmers to say that if the electricity supply undertakings would not give them supplies they would not allow the lines to cross their lands. Undertakings whose lines crossed land under those conditions should pay more for their poles than they paid for poles carrying lines which were giving service in the district.

Mr. W. Fennell, who emphasised that wayleave agreements should be as short as possible, said he had published a standard wayleave agreement form for his own area and it had been used with great success. He had found that the printing of such a form, including the printing of the amount to be charged, had enabled him to avoid arguments, and it could almost be said that in 99 cases out of 100 the landowners (for he ignored the tenants, inasmuch as they had not the power to make such an agreement) signed the agreements. The form gave three weeks' notice, under the 1919 Electricity (Supply) Act, that it was proposed to erect a line, and the form was accompanied by a small plan (of which a carbon copy was kept). The fee was one shilling per pole, or leg, and it was made clear that the electricity supply company accepted all risks. He had a line covering a distance of five miles on one estate, and the agreement was made on the form mentioned. There had been no squabbles, and the company was careful to pay up. The payment of solicitors' fees was unthinkable, and he had not paid one. One or two landowners had tried to do the business through solicitors, but as soon as they had realised the cost involved they had carried out the business direct. As soon as an attempt was made to define risks, landowners began to conjure what the risks were and became frightened. Further, if one had a standard form and worked carefully, local opinion could be formed against a man who refused to sign until he got a higher fee, and he soon was made to realise that it was no use standing out for a fee twice as high as that accepted by his neighbours.

Mr. Matthews (U.S.A.), who was asked for information about the practice in America, said there was a body of Commissioners in practically every State to whom the property owners or power companies could appeal. Usually power companies gave the Commissioners ten days' notice that they wanted to erect a certain line, and at the same time they gave notice to the property owners concerned; if no objections were raised by the time the notice expired, the power companies carried out the work. If a property owner objected, the difficulties were settled by the Commissioners in a short time. If at any time damages were proved, arbitrators were appointed to assess them.

Miss M. M. Partridge (Electrical Association for Women) agreed that a standard form, simple and short, was essential, and urged the importance of ensuring that it should have the approval of such a body as the National Farmers' Union, which would carry weight with the landowners and farmers; it would also help if the approval of some law society could also be obtained. She hoped that the rural branches of the Electrical Association for Women would be able to help by guiding public opinion with regard to wayleaves for overhead lines.

Mr. S. C. Bartholomew (G.P.O.) pointed out that it was much more simple to proceed by notice (stating that unless objections were raised it was the intention to erect a line) than to obtain definite consent, because many people would not take the trouble to object when notice of the intention to do the work was given; neither would they take the trouble to give consent when consent was necessary.

Mr. F. Christy supported the suggestion that the Association should get into touch with the National Farmers' Union and the Landowners' Association, because those two bodies were considering very closely wayleave agreements generally. In two cases, one in Devonshire and one in Somerset, overhead lines a good many miles long were to be erected and wayleaves were being sought; about half the people concerned had signed the agreements, but about 30 per cent. had stated that, although they saw no particular objection to granting the wayleaves, the Farmers' Union was looking into the matter and they would sign nothing until the Union had made a statement.

Mr. W. Fennell also supported the suggestion that the Association should get into touch with the bodies mentioned, and added that the Landowners' Society had produced a form which was shorter than that of the Electricity Commissioners, and more reasonable in respect of most of the details.

The President said there had been correspondence with the Land Agents' Society with regard to attending a meeting of the Association, and a representative of the National Farmers' Union had already attended a meeting of the Association.

Mr. F. Swarbrick, emphasising the great desirability of adopting a simple form, said he had followed the example of Mr. Fennell. Also, he had received considerable assistance from the local branches of the Electrical Association for Women, and was quite sure that that Association would be a source of strength in dealing with the problem of wayleaves.

Mr. J. Swan said that for 25 years he had been erecting lines in Buckinghamshire, and until two years ago had used a very simple form of agreement, by which the persons concerned consented to the erection of the poles, the positions of which were indicated by a sketch; it was also stated that the supply company would make good all damage and would pay one shilling per annum. That shilling covered any number of poles on one person's ground. More recently, however, high-voltage lines were being erected, and it had been found that the very short agreement which had been so suitable hitherto was hardly suitable for the new circumstances. Consequently, a new form of agreement was prepared, but it contained very few clauses; it was an agreement with the landowner in each case that a fee of a shilling per pole and sixpence per stay be paid to the tenants of the lands on which the poles were erected, because it was felt that the tenants were the people who were affected by the erection of the poles. That agreement had been very successful.

Mr. C. F. Mounsdon, supporting the suggestion that a standard form should be evolved with the help of the Landowners' Association and the National Farmers' Union, expressed the view that it would be futile to attempt to evolve a form of agreement which had not their approval, unless there were sufficient power to enforce it against all opposition.

Mr. W. Fennell said that railway crossings were a source of great difficulty and expense. He had managed to get into touch with one or two of the railway companies, however, and had proposed on behalf of the Association that there should be one wayleave agreement as between each railway company and each electricity supply authority, for which agreement a supply authority would not mind paying a fee of, say, two guineas (because it would not be recurring); then the supply authority would pay five or ten shillings for each crossing of that railway company's lines to cover the cost of making the plans, and that a general schedule should be fixed for crossing as was fixed for crossing other people's lands.

Major Theodore Rich (hon. secretary) complained that the cost of crossing roads was often greater than it need be.

Mr. Napier Prentice regarded the payment of wayleave rentals as unnecessary, and in support of his contention pointed out that the electrification of the land was worth more to a farmer than any rental he might receive. Furthermore, he had put his contention into practice, for he had electrified eight districts in East Anglia and had not paid wayleave rentals. The agreement form was simple; in it the supply company acknowledged and expressed thanks for the wayleaves and undertook to make good any damage, and to remove the wires if required on three months notice. He had never been asked to remove wires, however, except in cases in which houses were to be built on the routes, or for some other really good reason. Considerable assistance was derived from local advisory committees, consisting of people who were interested in seeing the districts developed electrically, and who gave their services free for that object; if a landowner objected to a wayleave unreasonably the committees' influence was brought to bear upon him.

Mr. W. E. Groves (mains engineer, Birmingham) said that the I.M.E.A. form had been used at Birmingham with a certain amount of success. Referring to the giving of notices for the removal of lines from lands required for development, he suggested that development should be defined as "building," with a view to preventing the giving of notice by landowners for inadequate reasons. He did not agree with varying payments from year to year in accordance with the uses to which the lands were put, because it would be a stupendous task to watch the variation of the class of cultivation, or the state of the ground, each year. The signing of agreements should be left in the hands of wayleaves officers, in order to avoid delay.

Mr. W. Fennell pointed out that one of the grid lines in the north-western area had been erected over a row of houses, so that the erection of buildings did not necessarily involve the removal of a line. He understood, also, that the rental was similar to that paid elsewhere.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Correction of Balance by Induction Motors.

"Student" raises a very interesting point in his letter in to-day's issue. Suppose we consider the matter in the following manner:—An alternator is supplying a three-phase load, which is heavily out of balance on one phase only; the machine is delta connected, the vector for which would be something like that shown in fig. 1 below:—

a is the loaded phase. Now, if we assume that 400 V is the working pressure, and the station voltmeter is on phase *a*, it may be seen that there would be no indication of what conditions were ruling in phases *b* and *c*, which, assuming these to be unloaded, would have no internal resistance or inductance; hence a pressure of 450 V might be expected upon these two phases.

Now, if an induction motor was switched on to this circuit, two phases would be receiving an excess voltage, which would increase the inductance load of the alternator in two phases over that taken by *a*. This would tend to lower the pressures on phases *b* and *c* of the alternator, and cause excessive heating of the iron in the motor. Further, since two phases of the motor receive higher pressure than the third, these two phases would each do more work than the third; again tending to

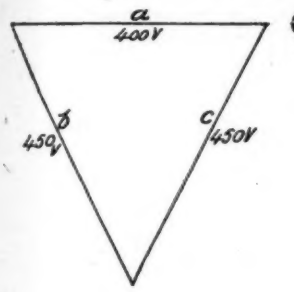


Fig. 1.

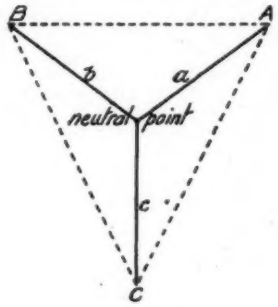


Fig. 2.

reduce the pressure in phases *b* and *c* in the alternator, and cause heating of the motor. This should now be clear, since all phases of the alternator would be equally excited, although the pressure on phase *a*, only, would be indicated. Exactly the same thing would happen when using a star connected alternator under similar conditions. I fail to see how the phase angles of an alternator can be greater or less than 120° if the coils are properly spaced, however heavily out of balance the machine may be; but I am open to correction.

One may easily test the phase angle of a supply circuit, which is invariably four-wire, by measuring the pressures from each outer to neutral, and those between each pair of outers, with a good voltmeter. Such tests should be taken as nearly as possible simultaneously. An examination of fig. 2 will make this clear, and, if matters are in order, A B=B C=C A, and $a=b=c$, and A B=$a\sqrt{3}$=B C=$b\sqrt{3}$=C A, etc. By moving the arm round, say, 5°, it will be seen that A B does not equal C A.

I trust that "Student" will now be quite *au fait* with this very interesting problem.

Delta.

October 18*th*, 1929.

Domestic Service.

Under the above heading I was pleased to see Mr. H. Willoughby-Ellis tackling vigorously a few old grievances. It is certainly necessary in all up-to-date installations to have as many outlets as possible for the use of the numerous useful domestic appliances now available. Up to a point, this is being advocated by all high-class contractors, but, as no standard has been set, the sockets are often just "stuck in" in a haphazard sort of way. The following is an extract from a supply company's specification:—"A 15-amp. switch and fuses to be used for not more than 4 sockets (heating) and 10 lighting points, the circuits to be arranged on the principle of 1 heating socket and no more than 6 lighting points per circuit." How on earth can we ever put our houses in order if supply companies are deliberately advocating this sort of thing? This also does not give us much opportunity of pointing a finger of scorn at the shoddy contractors, and is lowering the status of the whole contracting industry. The adage that shoemaker's children are the worst shod does not apply to our business, as most contractors are fully alive to the usefulness of electricity in the home. Personally, as I scribble these lines, I am sitting near my 3-kW fire, which I find is very useful and economical. Apart from this, I have found that by bringing people to my home to "see the things," further business has been the result without effort. I fully agree with Mr. Willoughby-Ellis that the shoddy contractor requires to be put under the limb of the law, and, as stated previously in these columns, I am willing to be one of the policemen, but—how are we to go about it? The problem is difficult.

A. Milne.

Glasgow, *October* 19*th*, 1929.

Electric Heating.

The trouble referred to in your last issue under the above heading is one that has been satisfactorily solved many times by the hot water and steam systems of heating where radiators have been placed under windows to correct down draughts.

In this case it seems that the trouble was only a case of not knowing that heat applied in this position is usually satisfactory for the purpose.

A. F. Caine,
A.M.I.E.E., M.I.H.V.E.

Wimborne, *October* 19*th*, 1929.

Megohms.

It is a healthy procedure occasionally to stand still to take stock of one's surroundings and to ask oneself, and possibly one's friends, if all our accepted standards and methods of procedure are necessary and desirable under existing conditions, *e.g.*, exactly how far present methods and routine are a survival of circumstances which have long since changed; for example, the desirability of employing a watchman to call the hours long after clocks were to be found in every house.

A trend of thought of this type caused the writer to ask himself whether the fetish of megohms is not a survival of direct-current working and earthed-return telegraph systems.

Take I.E.E. Regulation No. 127b, which states that the insulation resistance of an installation shall not be less in megohms than 25, divided by the number of points on the circuit (with the addition of certain provisos). On an alternating-current circuit, who would be a penny the worse if the figure obtained were 50 or even 25 per cent. of the scheduled value? Electrolysis on alternating-current supply is commonly supposed to be non-existent; telephone systems have both lines insulated and, so long as the installation is otherwise sound, and the lower value obtained on test is due to known and reasonable causes, *e.g.*, general dampness, type and extent of equipment connected, the writer would be quite prepared, if his premises are correct, to rest perfectly satisfied with the result.

An electricity supply engineer informed the writer that a short length of 2,000-volt cable had only shown 20,000 ohms to earth for the last five years and continued to function satisfactorily. Why, therefore, should he incur the cost and trouble of replacing it?

Argee.

October 18*th*, 1929.

The E.T.B.I.: An Urgent Appeal.

The Electrical Trades Benevolent Institution is sadly in need of additional capital, and I earnestly appeal to everyone connected with our great industry to assist in bringing the amount up to a minimum of £50,000. The present fund, £37,000, is wholly inadequate to meet the rapidly growing volume of claims. The number of grants made has increased six-fold during the last four years and now exceeds one per day.

Every possible effort is being made to place the fund upon a wider base of small annual subscriptions from the class which derives most benefit from the Institution, but for many years to come this source of income cannot be expected to do more than meet the immediate claims for relief of temporary distress, and the more serious necessity for pensions in cases of permanent disablement must remain unprovided for if our capital fund is not greatly increased.

There are at present on the books totally incapacitated claimants drawing small temporary relief, renewed from time to time, who could, if blessed with a small pension, retire to the country to spend their remaining days in comfort and at less expense.

Every year hundreds of good-hearted people help the Institution with their donations. To these I do most earnestly appeal to reconsider the amount of their donation in the light of their own position in the industry and remembering the vast army who when they fall upon evil days have a claim upon our benevolence. The majority of these people are earning little more than a living wage and cannot provide the necessary capital themselves.

Many employers subscribe large sums for the assistance and superannuation of their own staff—a splendid solution of much of our difficulty, but this does not help the employés of innumerable small firms and many large ones which have no such provision. At one time or another we do business with and make profit by all these people, so that although, no doubt, charity begins at home, we still have a responsibility towards others. I appeal then to those who are so generous to their own staff not to harden their hearts to the cry of the multitude without.

We are particularly wanting ten donors of £500 each to take up the ten vacant vice-presidencies of the Institution. Several gentlemen have already offered to do this, and I shall be very glad to hear from any reader of the Electrical Review who will come forward and do likewise.

We are also wanting fifty donors of £100 to take up life governorships. There are a great many who can afford this sum, and I am most anxious to get in touch with these to explain the great assistance this help will be at the present time.

The subscription for life membership is £10. Cheques for this or any amount larger or smaller will be most gratefully received.

A recent ruling has made it clear that gifts to the Institution will be added to previous gifts to qualify the donor for a life governorship or vice-presidency.

Full details of the Institution, with particulars of receipts and distribution, will be forwarded at once upon application.

Please address donations to the Secretary, Electrical Trades Benevolent Institution, 9, Southampton Street, Holborn, W.C.2, or to the undersigned at 40, Hatton Garden, London, E.C.1.

H. Marryat,
President, E.T.B.I.

London, E.C.1, *October 16th*, 1929.

The British Industries Fair.

May I call attention to an experiment in salesmanship which, I think, may interest many of your readers? Attempts have long been made to produce a material for all sorts of toilet and fancy goods, toys, electrical instruments, motor car fittings, &c., which would take the place of celluloid. Many substitutes of varying merits must have been evolved in the last few years, but it is one thing to discover and manufacture a new material, and it is another thing to discover all the possible uses or customers for it. The manufacturers of Vitreo-Colloid tried the experiment last February of exhibiting in the British Industries Fair. There they more or less sat still while visitors from all parts of the world discovered for themselves literally dozens of different uses for the material—uses of which the manufacturers had not dreamed. Originally intended for the side screens of motor cars, the material, since the Fair, has been in demand for telephones, wireless sets, non-inflammable lamp shades for homes, offices and kinemas, hair brushes, gramophone records, railway signal lamps, traffic policemen's white sleeves, photographic and kinema films, chocolate and biscuit wrapping paper, and what not. Such rapid progress in the marketing of a new product would never have been made but for the Fair.

P. S. Newbound.

London, S.W.1, *October 15th*, 1929.

Meter Jewels.

It is curious that your correspondent should refer to an I.E.E. meeting at which meter jewels were only more or less casually mentioned, and omit to mention a more recent I.E.E. meeting devoted entirely to meter bearings. At the latter discussion statistics were given that proved beyond doubt that oil-lubricated sapphire jewels were far superior to dry ones.

A.E.G. Electric Co., Ltd.

London, *October 16th*, 1929.

A D.C. Problem.

Will any readers of this journal assist me with the following problem? Suppose we are looking at a diagram of a two-pole d.c. machine in whose armature conductors a current is flowing The conductors under each pole face form in effect one single conductor, and their fluxes apparently combine and form a band, which encircles all the conductors under each individual pole face. For the purpose of this question we will ignore whether the machine is a dynamo or a motor, its direction of rotation, or the direction of flow of the armature currents; the main fact I wish to bring to light is, that with this band of flux round the armature conductors it is apparently impossible for any of the field flux to pass through the armature teeth immediately under the poles, but the entire flux must pass in the S-shaped formation from the north to the south pole.

Inquirer.

October 14th, 1929.

Legal.

Berg v. Electrolux, Ltd., and E. D. A. Herbert.

A settlement of this action was arrived at before the Lord Chief Justice in the King's Bench Division on October 15th.

Appearing for plaintiff, Mr. Levy said the action was for alleged libel and slander. Mr. John Gustav Berg, the plaintiff, had been engaged at a substantial salary by the defendant company. Later, Mr. Herbert became managing director of the defendant company and differences arose between him and Mr. Berg which made it clear that they could not work together. Mr. Berg decided to resign as soon as Mr. Herbert had become sufficiently in possession of the details of the administration, and he did so in October, 1928. It was not long afterwards that Mr. Herbert published the alleged libellous document. The suggestion made was that Mr. Berg's dismissal followed misconduct on his part. It was now desired emphatically to refute that suggestion.

Terms of settlement included the publication of a document to the effect that Mr. Berg had been engaged by the Electrolux Co. for 3½ years and his conduct had been eminently satisfactory. As the result of a change of policy his agreement as executive manager of the company was determined and no reflection was cast on his integrity or ability. He would be paid £150 and the defendants would pay his agreed costs amounting to £520.

Counsel for the defendants assented to the settlement and the record was accordingly withdrawn on the terms stated.

Agreements Between the G.E.C. and Marconi's.

The question of the continuance of two agreements, one between Marconi's Wireless Telegraph Co., Ltd., and the General Electric Co., Ltd., and the other between these companies and the M.O. (Marconi-Osram) Valve Co., Ltd., came before Mr. Justice Eve in the Chancery Division on October 16th, on a summons taken out by the General Electric Co., Ltd., to which the other companies were respondents. Mr. Gavin Simmonds, K.C., and Mr. Peel appeared for the General Electric Co., Ltd., and Mr. Wilfred Greene, K.C., and Mr. Uthwatt for the Marconi Co. The M.O. Co. did not appear.

Mr. Simonds said the summons was for the purpose of having these agreements construed, and the question of construction was whether, as the General Electric Co., Ltd., said, the agreements were subsisting and permanent, or whether, as Marconi's said, either the agreements were for a certain definite term or they had been determined. The first agreement dated August, 1919, recited that the G.E.C. owned a factory at Brook Green which was equipped and used for the manufacture of valves. The two companies agreed to form a private company for the purpose of acquiring this business. The capital of the company was to be £100,000 subscribed for by the two companies in equal shares, and the G.E.C. was to let the factory to the valve company for ten years at a rent of £1,400 a year, and to sell the plant, &c., for £17,000. Each company agreed with the other not to manufacture valves or import valves for sale. The valve company was duly formed in October, 1919, and the second agreement contemplated by the first was entered into in November. The Marconi Co. said that the obligations of the parties under both agreements were co-terminous with the lease, but he (Mr. Simonds) contended that the term did not end with the lease.

Mr. Greene submitted that the agreement automatically came to an end on the termination of the lease. The parties could not have contemplated entering into an agreement which would last for ever.

Mr. Justice Eve reserved judgment.

Electramonic Co., Ltd.

On October 15th in the Companies Winding-up Court, Mr. Justice Romer heard a petition by Celestion, Ltd., for the compulsory liquidation of the Electramonic Co., Ltd. Mr. C. Duncan, for Celestion, Ltd., said that the Electramonic Co. was insolvent and unable to meet its obligations. His clients were creditors for £4,000; various executions had been levied but they remained unpaid. Mr. Wynn Parry, for the respondent company, said that since the petitioning company had secured control there had been an attempt to wreck the Electramonic Co. He read an affidavit by Mr. Sayers, managing director of the respondent company, in which he maintained that the petition was an attempt to break up the company so that its assets could be acquired cheaply. He alleged that the respondent company had a counterclaim against the petitioners. Counsel proceeded to state that under an agreement the respondent company was to become a selling concern for "Celestion" products. That morning the respondent company had obtained an injunction restraining Celestion, Ltd., from passing off as the respondent company's goods which were not actually of its manufacture.

Mr. Christie, who said that he represented creditors for £20,000, opposed the petition. He stated that now the control had been taken out of the hands of the petitioners or their nominees there was a chance of the company's being successful. Mr. Duncan refuted the allegations made by Mr. Sayers and asked for a compulsory winding-up order. His Lordship said that he was satisfied that the respondent company had a *prima facie* case entitling it to claim damages from the petitioners. The latter must have been aware of that when making their application and he therefore dismissed the petition with costs.

Mullard Radio Valve Co., Ltd., v. London Radio Co.

The case of the Mullard Radio Valve Co. against the London Radio Co. (Leeds) came before Mr. Justice Eve in the Chancery Division on October 18th. Counsel said it was a motion for an injunction to restrain the defendant company from infringing the plaintiffs' patent by selling valves in breach of the licence. The defendants appeared and consented to the injunction and to treat the motion as the trial of the action. They would pay ten guineas agreed damages and the costs of the action. Counsel asked that the notice of motion might be amended to read: "by selling valves below the price fixed by the licence."

Counsel for the defendants assented, and his Lordship granted an order in the terms arranged.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

8,887. "Electric time switching systems." J. Tammerik. March 23rd, 1928. (Convention date not granted.) (288,1444.)
9,356. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. August 4th, 1927. (295,006.)
9,762. "Electric furnaces." V. Stobie. March 31st, 1928. (319,802.)
12,409. "Devices for amplifying sounds." R. F. Tack. April 27th, 1928. (319,708.)
14,898. "Automatic train-control for railways." G. Kemmann. May 20th, 1927. (290,987.)
15,047. "Automatic current limiting and regulating devices for use in electrical signalling." G. A. Mathieu. May 22nd, 1928. (Addition to 288,371.) (319,674.)
15,556. "Counting mechanism for two-rate electricity meters." Landis and Gyr Soc. Anon. September 30th, 1927. (297,812.)
15,930. "Picture and the like facsimile telegraph transmitters." G. M. Wright. May 31st, 1928. (319,809.)
17,330. "Metallic conduits for electrical conductors." W. Shaw, G. Heptonstall and B. L. Meyer. June 15th, 1928. (319,595.)
17,750. "Variable-resistance devices." Igranic Electric Co., Ltd., and G. F. Dandridge. June 19th, 1928. (319,598.)
17,842. "Machine for twisting together wires or strands." Standard Telephones and Cables, Ltd., and W. K. Weston. June 20th, 1928. (319,632.)
17,843. "Electric signalling and indicating apparatus and the like." H. S. Cowx. June 20th, 1928. (319,600.)
17,910. "Arrangement for synchronising the selectors in long-distance control systems." Akt. Ges. Brown, Boveri et Cie. June 20th, 1927. (292,522.)
17,955. "Electric accumulators." C. J. Ward and S. E. Hillman. June 21st, 1928. (319,634.)
18,004. "Electrically-operated closing means for vertical-chamber ovens." Ramag-Meguin Akt. Ges. June 21st, 1927. (292,539.)
18,136. "Electromagnetic relays for controlling electric circuits." Soc. Nouvelle de Constructions Téléphoniques Brevets Tchoubritch-Dervall. July 29th, 1927. (294,641.)
18,170. "Electric cleaner." Soc. de Paris et du Rhone. September 10th, 1927. (296,978.)
18,317. "Electric protective systems and relays for use therein." A. Reyolle & Co., Ltd., H. Leben, and N. Cooke. June 25th, 1928. (Cognate application, 22,098/28.) (319,637.)
18,337. "Loud-speaker system." Brandes, Ltd. (Federal Telegraph Co.). June 25th, 1928. (319,639.)
18,430. "Electric control apparatus for use in lift installations." Medway's Safety Lift Co., Ltd., and B. A. Siden. June 25th, 1928. (319,645.)
18,442. "Electrical resisting bodies." Carborundum Co., Ltd. (Carborundum Co.). June 25th, 1928. (319,647.)
18,526. "Means for controlling light intensity in kinematograph apparatus." F. G. A. Roberts. June 26th, 1928. (319,678.)
18,537. "Electrical power distribution systems." H. Pearce and Associated Electrical Industries, Ltd. June 26th, 1928. (Cognate application, 22,413/28.) (319,813.)
18,625. "Compensation for phase variations on telegraph and telephone transmission lines." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). June 27th, 1928. (319,712.)
18,626. "Automatic or semi-automatic telephone systems." Standard Telephones and Cables, Ltd., J. H. E. Baker, E. P. G. Wright, and A. H. Cameron. June 27th, 1928. (319,713.)
18,649. "Sound-reproducing systems, and apparatus therefor." F. C. Tomlins. June 27th, 1928. (319,715.)
18,694. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., C. E. Beale, and R. Taylor. June 27th, 1928. (319,716.)
18,801. "Variable-capacity electric condensers." T. A. W. Robinson. June 28th, 1928. (319,819.)
18,834. "Vacuum electric tube devices." A. S. Cachemaille (Westinghouse Lamp Co.). June 28th, 1928. (319,823.)
18,872. "Trip or cam mechanism, particularly applicable to prepayment devices for use with electric meters." C. E. Fry. June 29th, 1928. (319,825.)
18,874. "Prepayment devices for use with electric meters or the like." C. E. Fry. June 29th, 1928. (319,826.)
18,875. "Release mechanism, particularly for use with electric meters, remote release switches, or the like." C. E. Fry. June 29th, 1928. (319,827.)
18,966. "Manufacture of leaded conductors." Electrical Research Products, Inc. September 10th, 1927. (296,979.)
19,032. "Electro-optical transmission systems." Electrical Research Products, Inc. July 2nd, 1927. (293,308.)
19,222. "Electric power supply apparatus." General Electric Co., Ltd., and W. Wilson. July 3rd, 1928. (319,834.)
19,249. "Performance on short circuit of rotary convertors and direct-current dynamos." English Electric Co., Ltd., and G. Schroeder. July 3rd, 1928. (319,835.)
19,281. "Electrical connectors." Siemens Bros. & Co., Ltd., and W. E. Goodwin. July 3rd, 1928. (319,837.)
19,336. "Anti-dazzle devices for the headlights or lamps of motor vehicles." A. Sinclair. March 26th, 1929. (319,842.)
19,434. "Electric time-pieces." Soc Anon. des Etablissements, L. Hattat. July 6th, 1927. (Patent of addition not granted.) (293,423.)
19,601. "Electrically-heated apparatus for evaporating, distilling, and the like." J. A. Reavell. July 6th, 1928. (319,849.)
19,934. "Electric excess supply meters." Telefonaktiebolaget L. M. Ericsson. March 14th, 1928. (307,819.)
20,001. "Electric plug-and-socket devices." Santon, Ltd., and H. C. Sanders. July 10th, 1928. (319,851.)
20,510. "Manufacture and production of magnetic cores of high permeability." J. Y. Johnson (I. G. Farbenindustrie Akt. Ges.). July 14th, 1928. (319,854.)
20,816. "Junction boxes for electric cables." C. P. Seckham. July 18th, 1928. (319,858.)
20,936. "Electrical switches. Burovox, Ltd., S. C. Smith-Winfield, and W. P. Fraser. July 19th, 1928. (Cognate application, 31,526/28.) (319,861.)
21,273. "Circuits of ignition and lighting generators." International General Electric Co., Inc. July 21st, 1927. (294,481.)
22,147. "Loud-speakers." F. Charles. July 31st, 1928. (319,874.)
22,199. "Electrically-heated vessels provided with covers." R. Frister Akt. Ges. May 2nd, 1928. (317,867.)
22,414. "Electric potential regulators." L. H. A. Carr and Associated Electrical Industries, Ltd. August 2nd, 1928. (319,877.)
23,643. "Sound-reproducing devices." A. F. R. Cotten. August 16th, 1928. (Cognate application, 4,993/29.) (319,883.)
23,727. "Armoured cables." Siemens-Schuckertwerke Akt. Ges. and E. Willie. August 17th, 1928. (319,884.)
24,833. "Electric discharge devices." Siemens and Halske Akt. Ges. August 27th, 1927. (296,314.)
24,933. "Construction of high-tension electric cables." E. S. Ali-Cohen. September 8th, 1927. (296,784.)
26,413. "Permanent magnets." M-L Magneto Syndicate, Ltd., and E. A. Watson. September 14th, 1928. (319,915.)
27,127. "Electric switches." F. C. Fahy, W. H. Wilkinson, and J. W. Parkinson. September 21st, 1928. (319,922.)
27,436. "Electrical heaters." T. L. Rimmer. September 24th, 1928. (319,929.)
28,588. "Thermal cut-outs for electrically-heated receptacles." Burnley Components, Ltd., and D. K. Ward. October 5th, 1928. (319,938.)
28,661. "Mercury-vapour lamp." S. Von Bogandy and L. Wamoscher. October 15th, 1927. (298,896.)
29,197. "Loud-speaker telephone instruments." J. L. Bernard. October 10th, 1928. (319,942.)
29,443. "Sound-reproducing and recording device." H. Hallam and J. R. M. Helary. October 14th, 1927. (Addition to 285,454.) (298,643.)
33,064. "Methods of protection of electric conductors." International General Electric Co., Inc. November 11th, 1927. (300,510.)
33,534. "Systems of distributing electrical signals." A. Warwick, J. A. A. Taylor, and H. C. Holmes. November 16th, 1928. (319,984.)
34,234. "Electric signs." Longsign Corporation. November 21st, 1927. (300,971.)
36,057. "Electric starting apparatus for motor-vehicle or other engines." Ateliers Vaucanson and P. Marchal. December 8th, 1927. (301,918.)

1929.

888. "Electric variable condensers." S. Moss. January 10th, 1929. (320,001.)
1,950. "Alternating-current rectifiers." Koch & Sterzel Akt. Ges. January 21st, 1928. (304,600.)
2,764. "Machine drives by means of electric motor and back-pressure turbine." International General Electric Co., Inc. January 28th, 1928. (305,029.)
9,699. "Electric gramophone pick-ups." P. D. Tyers. June 26th, 1928. (Divided application on 18,493/28.) (319,717.)
19,707. "Telephone systems." Associated Telephone and Telegraph Co. October 19th, 1927. (Divided application on 299,607.) (314,403.)
20,419. "Manufacture and production of magnetic cores of high permeability." J. Y. Johnson (I. G. Farbenindustrie Akt. Ges.). July 14th, 1928. (Divided application on 20,510/28.) (320,016.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 16th :—

S'iovim. No. 505,145. Class 6. Electric vacuum cleaning machines.—C.C.A. (Vacuum Cleaners), Ltd., 324, Gray's Inn Road, W.1.

Le Miroir de la Voix (lettering and design). No. 501,543. Class 8. Radio-telephonic apparatus and parts thereof, sound amplifying apparatus, &c.—La Comoagnie Générale des Machines Parlantes Pathé Frères, Paris. (British representatives: Fell & James, 11, Queen Victoria Street, E.C.2.)

Heart. No. 504,200. Class 8. Thermionic valves, battery eliminators, accumulators, transformers, and condensers, &c., all used in connection with radio-telephony.—Adolf Knopf, trading as the Wholesale Guarantee Incandescent Supply Stores, 25, Waterloo Road, S.E.1.

Twin Cone (lettering and design)). No. 504,679. All goods in Class 8.—Arthur Green, Wilga, Warwick Road, Coventry.

Cable Drum and Flex Reel (designs only). Nos. 504,737 and 504,738. Class 8. Electric cables and flexibles.—C. J. Vogel Draht und Kabelwerke Gesellschaft, Berlin. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Trojan. No. 505,760. Class 8. Radio-telephonic apparatus, and parts thereof, &c.—British Homophone Co., Ltd., 67-69, City Road, E.C.1.

Ostar. No. 495,023. Class 13. Incandescent electric lamps (ordinary), electric switches, and switch holders.—Percy Thomas, 37, New Road, E.1.

Rees-Stevens Traction System, Rees Roturbo Mfg. Co., Ltd., Wolverhampton (lettering and design). No. 502,981. Class 22. Motor-driven trolley omnibuses.—Rees Roturbo Manufacturing Co., Ltd.

H.M., Ltd., British (lettering and design). No. 495,374. Class 50. Ammeter and voltmeter cases, battery cases, panels and like fittings for radio-receiving sets, switch covers and moulded parts of electrical control gear, &c., made from moulding powders composed chiefly of synthetic resin.—Healey Mouldings, Ltd., 239 and 241, Great King Street, Birmingham.

Bagasite, No. 502,021, and Megasite, No. 505,448. Class 50. Compositions made from vegetable fibre, and pulps and articles made from such compositions, viz. electric insulators, electric junction boxes, lamps and lampholders, reflectors and similar fittings for electric lighting, panels, bases and cases for electrical and radio instruments, &c.—Merchant Trading Co., Ltd., 52, Bishopsgate, E.C.2.

Design only. No. 504,193. Class 50. Electrical insulating preparations.—Berry, Wiggins & Co., Ltd., Water Lane, Stratford, E.15.

Lithene. No. 503,760. Class 50. Plastic compositions made wholly or principally from cellulose acetate and from other cellulose derivatives, and goods manufactured from such compositions, including cases and panels for loud-speakers, electrical switch covers and pushes, transformer covers, &c.—Plastic Moulding Co., Ltd., 104, Albion Road, Stoke Newington, N.16.

The Severn Barrage Scheme.

Mr. D. J. Vaughan, M.P., speaking at Newnham, is reported by *The Times* to have said that the Severn barrage proposal was a commercial proposition. It would require national funds, and the cost would be from £20,000,000 to £25,000,000. The report on the proposal would not be available for another year, and when issued would have to survive criticism, if not opposition, from experts and interested bodies of all kinds. The barrage would be in the neighbourhood of the Severn railway tunnel, where there were magnificent rock foundations. Part of the barrage could, if necessary, carry both the road and the railway bridge over the Severn. In any case the road and the railway bridge ought to be near the barrage. The turbines at the barrage would provide electric energy at a fraction of a penny a unit, and would revolutionise industry even as far as the Midlands. The production and distribution of electrical energy would displace coal to some extent, but there would be compensating factors. Cheap power should lead to industrial expansion, which would provide more employment. The immense sheet of water enclosed by the barrage would attract industries to what would be one of the largest harbours in the world. The barrage would mean to the south-west what the Manchester ship canal had meant to the north. He urged local authorities to push forward both the barrage scheme and that for a road bridge. The Government Departments would appreciate the national character of both proposals if sufficient pressure were brought to bear.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALTON.—Rebuilding Treloar Cripples' Hospital; secretary.

AYRSHIRE.—Laboratories and buildings at Auchincruive, for Hannah Dairy Research Institute; chief surveyor, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh.

BANSTEAD (Surrey).—Houses (86), Roundwood Way, for Perry's (Ealing), Ltd.

BARNSLEY.—Town Hall extension (£40,000). Nurses' home, Kendray Hospital (£12,500); borough engineer. R.C. school (300 places), at Ardsley; trustees. Extensions, saw mills, Twibell Street; Co-operative Society, Ltd. Additions, Racecommon Road; Eagle Manufacturing Co.

BERKHAMSTED (Herts.).—Hospital, Ashlyns Hall estate, for the Foundling Hospital, London; secretary, 40, Brunswick Square, London, W.C.

BINGLEY.—Extensions, Grammar School (£14,400); West Riding county architect, Wakefield.

BIRMINGHAM.—Schools, Severne Road, Hall Green (£20,000); and Trescott Road, Northfield; Education Committee.

BOURNEMOUTH.—Houses (43), Charminster site. Promenade extension (£85,000); borough engineer.

BRADFORD.—Training centres at various schools, for the E.C.

BREDBURY AND ROMILEY.—Housing scheme (60), for the U.D.C.; surveyor.

BRIDLINGTON.—R.C. schools; Rev. Father O'Rourke, parish priest.

BRIERLEY HILL.—Additional 122 houses, for the U.D.C.; J. Yorke, surveyor.

CALDY (Birkenhead).—Electric lighting installation, Parish Church; vicar.

CHESTERFIELD. — Extensions, Chesterfield and North Derbyshire Royal Hospital; governors.

CLACTON-ON-SEA.—Senior school; director of education, County Education Offices, Chelmsford.

CLYDEBANK.—Baths (£30,000), for the Corporation; burgh surveyor.

COLEFORD.—Housing scheme (50), for the U.D.C.; surveyor.

COULSDON.—Houses (56), Whyteleafe estate; O'Sullivan, Ltd.

DEVIZES.—Catholic schools; Geoffrey Raymond, architect, Basingstoke; F. Rendall & Sons, builders.

EDINBURGH.—School (£25,000), for the Education Authority; master of works, Education Authority.

GLASGOW.—Houses (90), Carntyne estate; tenements and shops, Gallowgate area; housing director. Elementary schools, Calder Avenue, Knightswood, and Germiston, for the E.C.

GODALMING.—Bazaar premises, High Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

GOOLE.—Housing scheme (78), Marshfield estate; surveyor to U.D.C.

GRAVESEND.—Employment exchange, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

GREASBROUGH (Yorks.).—Housing scheme (50), for the U.D.C.; surveyor.

GREENHITHE (Kent).—Electric lighting installation, Parish Church; Rev. E. A. W. Topley, rector.

HASTINGS.—Shops and flats, Queen's Road; H. M. Jeffery, architect. Shops (2) and houses (9), for Bexleigh Estates, Ltd., Bexhill Road; H. Ford, architect.

HOYLAND.—Senior school (600 places); West Riding E.C.

HULL.—Rehousing scheme, Aldbro Road improvement area; elementary schools at Hall Road, Westcott Street, and Rustenberg Street; conversion of Springhead Hall into golf club house; city architect. Development of building estate, off Gillshill Road; A. L. Windross and Partners, Ltd.

HURDSFIELD (Cheshire).—Electric lighting installation, Holy Trinity Church; incumbent.

HURLFORD.—Housing scheme (58), for Ayrshire C.C.; T. C. Stewart, Clydesdale Bank Buildings, Kilmarnock.

INVERNESS.—School at Inverlochy, Fort William, for Inverness County Education Authority; master of works, 11, High Street.

ISLE OF WIGHT.—Reconstruction of Royal County Hospital (£11,189); J. Ball & Sons, builders, Cowes.

KINGSTON-ON-THAMES.—Extensions, Grange Road, for the borough E.C. (£12,913); W. H. Gaze & Sons, builders.

KILMARNOCK.—Housing scheme (100), for the T.C.; burgh surveyor.

LONDON (Stoke Newington, N.).—Town hall (£92,000); B.C. Special Committee.

(Islington, N.).—Houses (113), Warltersville estate; Eadie, Towers & Co., Wolverhampton.

(Camberwell, S.E.).—Extensions, Grove Hospital, for the M.A.B. (£18,705); J. Crewsdon, Horley.

(Bermondsey, S.E.).—Factory extensions, Weston Street and Market Street; Geo. Parker & Sons, Ltd.

(Surbiton, S.W.).—Pumping stations, for the M.W.B. (£70,000); A. R. Turner, 30, Bedford Square, W.C., quantity surveyor.

(Ealing, W.).—Houses (261); H. S. Bostock, architect. Petrol station, showrooms, and maisonettes (over), at Gunnersbury Avenue; Hoare & Wheeler, architects, 22, Portman Street, Portman Square, W.1. Houses (76) and garages (46), Whitton Avenue; P. H. Edwards, Ltd., 237, Golders Green Road, N.W.11. Alterations and additions to Palladium Cinema, The Broadway; W. L. Trent, 123, Regent Street, W.1.

LOUTH.—Additional housing scheme (104), for the T.C.; borough surveyor.

LOWESTOFT.—Elementary school, Kirkley Run, for the E.C.

MAUCHLINE.—Housing scheme (32), for Ayrshire C.C.; T. C. Stewart, Clydesdale Bank Buildings, Kilmarnock.

MOTHERWELL.—Garage at Wishaw, for Messrs. Stewart and McDonald; the manager.

ORSETT (Essex).—Surgical block (£13,350), for the B.G.; clerk.

PONTEFRACT.—Housing scheme, Airedale (48), for the R.D.C.; Tennant & Smith, architects, Ropergate (returnable deposit of £2).

REIGATE.—Electric lighting installation, portion of institution, board room, &c., for the Board of Guardians; clerk.

ROTHERHAM.—Block of shops, Swallownest, for the Co-operative Society; secretary. Shops (12) and offices (£30,000), for the T.C.; borough surveyor.

SKIPTON.—Extensions, Grammar School (£21,000); West Riding county architect, Wakefield.

SOUTHEND-ON-SEA.—Two senior schools (£44,000) and school, Wentworth (£50,500), for the borough E.C.; J. Sargent, director of education.

SOUTHPORT.—Extensions, King George V School, for the borough E.C.; director of education.

STOKE-ON-TRENT.—Extensions, maternity home (£35,000); medical officer of health. Extensions, isolation hospital; W. H. Ward, architect.

SUNBURY.—Additional 100 houses, for the U.D.C.; surveyor.

SUNDERLAND.—Hospital (120 beds); Henderson Bros., builders, South Shields.

SWANSEA.—Houses (50), Manselton estate; Sir C. Mansell.

THORNE.—Elementary school (£34,500); West Riding county architect, Wakefield.

TILSTON FEARNAL (Cheshire).—Electric lighting installation, Parish Church; vicar.

TORQUAY.—Development, building estate, Park Hill Road; Stanley Richards & Co. Bandstand and enclosure (£55,000), for the T.C.; borough surveyor. Municipal buildings; Bridgeman & Bridgeman, architects.

WALTON.—Electrically-equipped pumping station at the sewage works, for the Reigate R.D.C.; Bertram Kershaw, engineer.

WEST RIDING. — School, Mitchell Memorial Homes (£24,000); West Riding E.C.

WOLVERHAMPTON.—Hotel, Merry Hill (£7,000), and grammar school extensions (£14,000); T. W. Edwards and Sons, builders, Stourbridge.

WORCESTERSHIRE.—16 senior schools (£325,000) and five junior schools (£30,000); alterations to 14 other schools; County E.C.